MODEL M300 SERVICE MANUAL

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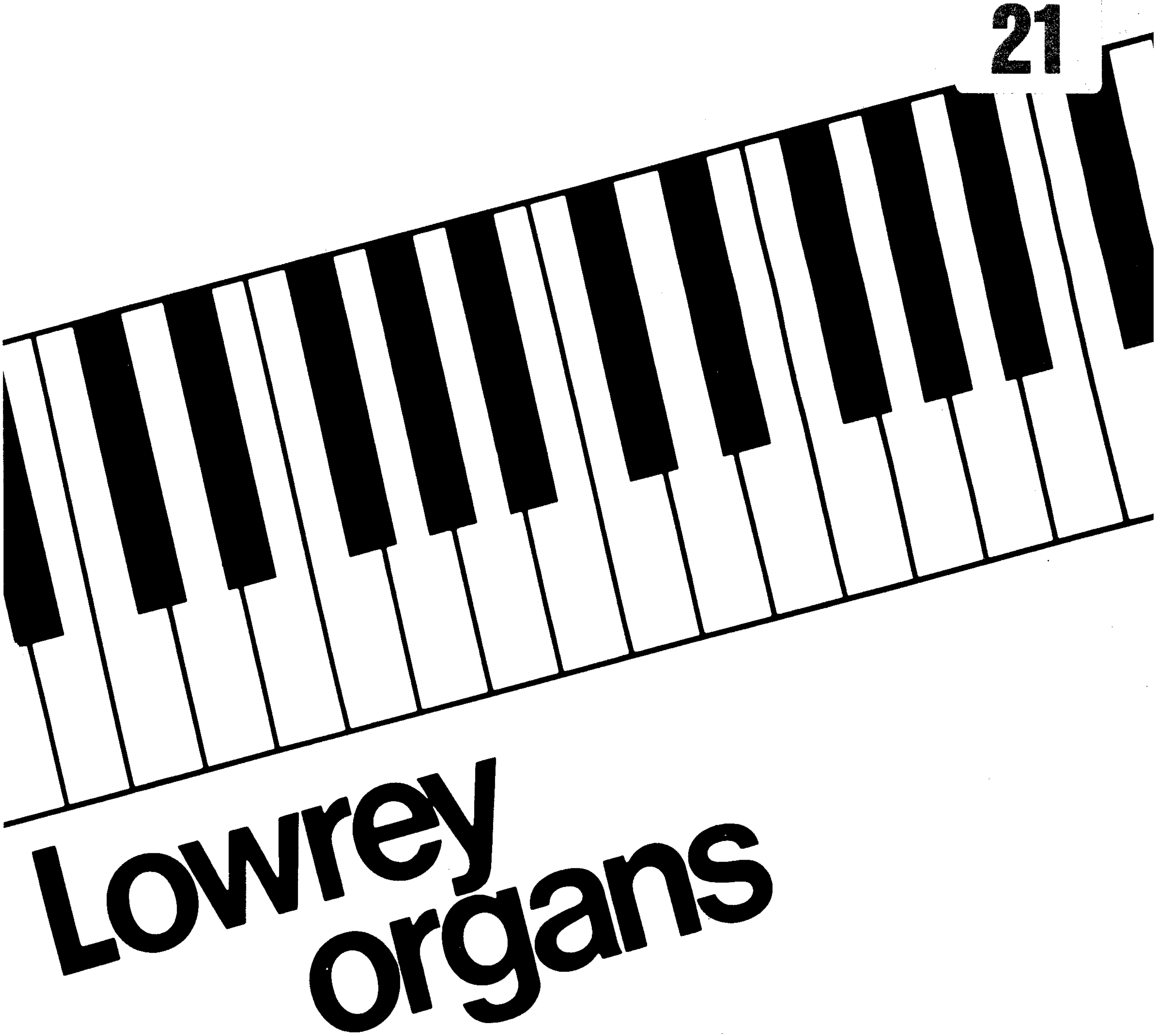

Lowrey organs

JAMBOREE

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MODEL M300

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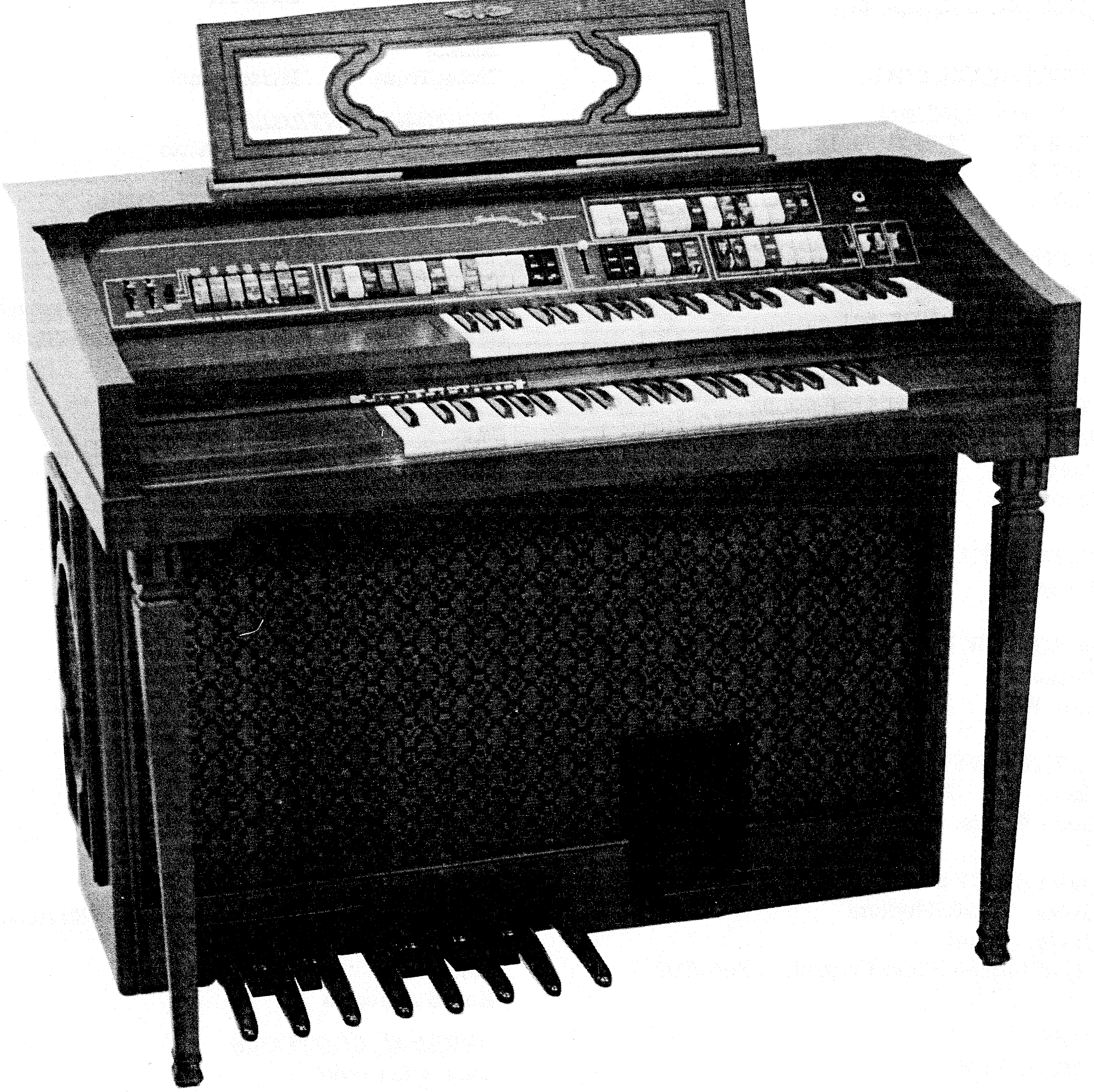
SPECIFICATIONS



SPECIFICATIONS

LOWREY JAMBOREE (Model M300)

A completely solid-state, large-scale integrated circuit (L.S.I.C.) and transistor, self-contained home spinet organ with two 44-note keyboards and a 13-note pedal board.

The organ includes two 25-watt amplifiers, two 12-inch bass speakers, one 8-inch main speaker and one 8-inch Leslie speaker.

UPPER KEYBOARD

CUSTOM VOICING

Flute 16
Flute 8
Flute 4
Trombone 16
Oboe 16
Cello 16

CUSTOM VOICING CONTROLS

Sustain Length Control

SUSTAIN/PERCUSSION PRESETS

Vibes
Vibra Harp
Hawaiian Guitar
Piano
Harpsichord
Mandolin
Banjo
Harmonic Flute
Percussion. . . Repeat/Solo Percuss

SLOW ATTACK PRESETS

Accordion
Piccolo
Violin

AUTO WOW PRESETS

Harmonica
Auto Wow

EFFECTS PRESETS

Vibrato Control

LOWER KEYBOARD

Piano
Guitar
Banjo
Genie Voices. . . Normal/Plus Organ

LOWER KEYBOARD CONTROLS

Lower. . . Soft/Medium
Lower. . . Full
Flute Volume Slider Control. . . Soft/Full

BASS

PEDAL BASS

Pedal. . . String Bass/Guitar Bass
Pedal Sustain

KEYBOARD BASS

String Bass
Guitar Bass

BASS CONTROLS

Bass. . . Soft/Medium
Bass. . . Full

AUTOMATIC RHYTHMS

RHYTHM PATTERNS

Ballad
Dixie
Country
Swing
Waltz I
Waltz II
Merengue
Samba
Bossa Nova
Rhumba
Cha Cha
Latin Rock
Rock I
Rock II
Rock III
Tango
March
Metronome

RHYTHM CONTROLS

Rhythm Start. . . Normal/Auto
Rhythm Volume. . . Min/Max
Rhythm/Repeat Speed. . . Slow/Fast

GENIE

Magic Genie Chords
Guitar Strum
Ukulele Strum
Piano Arpeggio
Harpsichord Arpeggio
Boogie Woogie Bass

MAGIC GENIE CHORDS

Key Note	Gives this Chord
A1	A Major
A#1	A#B_b Major
B1	B Major
C1	C Major
C#1	C#D_b Major
D1	D Major
D#1	D#E_b Major
E1	E Major
F1	F Major
F#1	F#G_b Major
G1	G Major
G#1	G#A_b Major

MAGIC GENIE CONTROLS

A2 Lower Keyboard Key adds 7th to Magic Chord
Minor Footswitch
Slow Pick
Keyed Arpeggio

GENERAL CONTROLS

Expression Pedal
Glide Footswitch on Expression Pedal
On/Off Switch with Pilot Light
Leslie Tremolo On/Off
Chorus On/Off

GENERAL FEATURES

Leslie Speaker
Auxiliary Input Jack
Stereo-Headphone Jack

CIRCUIT DESCRIPTION

SCHEMATIC 1

VIBRATO, TONE GENERATORS & DIVIDERS

The Tone Generators consist of the Master Oscillator Q4, the Top Octave Synthesizers IC1 & IC2, the IC Dividers IC3-IC12 and Vibrato Oscillator Q2 & Q3. The Master Oscillator creates a high frequency signal which is applied to the Top Octave Synthesizers IC1 & IC2. Here the signal is divided to create thirteen specific octave frequencies which are applied to the IC Dividers where these frequencies are divided in half several times creating lower octave frequencies. These signals are then connected through diodes to Upper and Lower Keyboard Diode Keying circuits and also directly to the Pedal Diode Keying circuits.

Q1 VIBRATO DELAY SWITCHER

Turning on the Harmonica, Auto Wow, Violin, Piccolo or Vibra Harp Tabswitches connects the collector of the Vibrato Delay Trigger Q67 to the base of the Vibrato Delay Switcher Q1 (via Point AL on the Vibrato Delay Tabswitch contacts.) Each time a key is pressed a positive pulse is developed at the collector of Q67. This pulse is applied to the base of Q1 causing Q1 to conduct which grounds the Vibrato Oscillator, momentarily turning it off. This causes a short delay time before the vibrato is heard on the above-mentioned voices.

Q2 & Q3 VIBRATO OSCILLATOR

The Vibrato Oscillator develops a continual low frequency (6.3Hz) sine wave of sufficient amplitude to shift the frequency of the Master Oscillator high and low creating a Vibrato effect. The output from the Vibrato Oscillator is applied to the Master Oscillator and CFG Master Oscillator via the Vibrato switching contacts. It is also applied directly to the Tremolo Lamp Driver Q16 and through the Harmonica Tabswitch to LED Driver Q70. Turning on the Violin, Piccolo or Hawaiian Guitar tabswitches connects the Vibrato Oscillator to both Master Oscillators, automatically adding Vibrato on these voices. Turning on Hawaiian Guitar also removes a 2.2K resistor from ground at the output of the Vibrato Oscillator giving the Hawaiian Guitar a heavier vibrato. To obtain vibrato with the Kinura, Viola, Cello, Oboe and Trombone voices, the vibrato tabswitch must be turned on. Turning on a Rhythm in the Magic Chord mode cancels the vibrato of the Lower Keyboard.

NOTE: Turning on the Vibes, Piano, Mandolin, Banjo or Harmonic Flute tabs will cancel vibrato by opening the path from the Vibrato Oscillator to both Master Oscillators through the Vibrato Switching Contacts. The vibrato of the Vibes, Vibra Harp and Harmonica will not be cancelled because the Vibrato Oscillator is connected to these circuits ahead of the vibrato switching contacts.

Q4, IC1 & IC2 MASTER OSCILLATOR & TOP OCTAVE SYNTHESIZERS

Q4 develops a continual high frequency signal which is sent to the Top Octave Synthesizers IC1 & IC2. Here the signal is divided simultaneously to produce thirteen specific audio frequency signals. These signals are connected to the Upper & Lower Keyboard Diode Keying circuits and also the IC Dividers IC3-IC12 where they are divided down to produce lower organ tones. The signal outputs are of a particular octave frequency and are shown boxed on Schematic 1. (The letter-number designation within these boxes refer to a specific octave frequency and should not be confused with a keyboard designation.)

IC3-IC12 IC DIVIDERS

Audio signal from the TOS is applied to the IC Dividers where these signals are divided in half several times to create lower organ frequencies. A chart is provided on Schematic 1 giving the specific outputs of each divider. IC11 & IC12 outputs are used for the lowest seven upper keyboard notes when the Flute 16 voice is on, and for the lowest three lower keyboard notes when the Magic Genie Chord tab is off. Part of IC11 is also used for the Pedal Divider.

SCHEMATIC 2

UPPER KEYBOARD DIODE KEYING GROUPS, FLUTE SWITCHING, COLLECTOR AMPS & LESLIE PREAMPS

Audio signal from the Tone Generators (via the Upper Keyboard Diode Keying circuitry - see Schematic 6) is divided into groups of six to seven notes each called Diode Keying groups. These groups are filtered individually by the upper keyboard Flute filters for each organ footage: 4, 8 and 16. After filtering, the signal from the Diode Keying groups is collected and amplified before being sent to voicing circuits where the various organ voices are created. The Flute signal is applied to the Leslie Preamps where it is amplified before being routed to the Leslie Mixing Preamp and the Chorus Input Low-Pass Filter.

Q7 & Q8, Q11 & Q12, Q22 & Q23 - 4, 8 & 16-FOOT FLUTE COLLECTOR AMPS & SWITCHERS

Audio signal from 4, 8 and 16-foot Flute Collector lines is applied to its associated Flute Collector Amp where the signal is amplified. The output of each Flute Collector Amp is then connected to its associated Flute Switcher. The Flute Switchers are N Channel FET transistors and are gated off by a negative voltage at their gate. Turning on a Flute tabswitch removes this negative voltage causing the switcher to conduct, allowing the Flute signal to pass to the Leslie Preamps.

Q6 VIOLIN COLLECTOR AMP

Audio signal from the 4-foot Diode Keying groups is applied to the Violin Collector Amp Q6 via the Violin Collector line. Here the signal is amplified then routed through a Violin 4 tabswitch contact to an R/C voicing circuit where the proper Violin tonality is created. After the signal is voiced, it is then applied to the input of the Percussion and Slow Attack Modulator IC14.

Q9 & Q10 4-FOOT PERCUSSION COLLECTOR AMPS

Turning on either the Harmonic 4, Vibes or Piccolo 4 tabswitch allows audio signal from the 4-foot percussion collector line to pass to the 4-foot Percussion Collector Amps. Here the signal is amplified and then voiced before being applied to the input of the Percussion and Slow Attack Modulator IC14.

Q13, 14 & 15 16-FOOT MAIN FLUTE, VIBRA HARP & VIBES COLLECTOR AMPS & PREAMP

Audio signal from the 16-foot Main Flute, Vibra Harp & Vibes Collector Line is applied to Q13 & 14 where it is amplified. Turning on the Flute 16, Vibra Harp or Vibes tabswitch allows this signal to pass through Tremolo Photocell P1 to Q15. Here the signal is amplified and voiced before being applied to the Main Preamp Q37.

Q16 & Q17 TREMOLO LAMP DRIVERS

Sine wave input is applied to the Tremolo Lamp Drivers from the Vibrato Oscillator and is transformed to a series of high current positive output pulses at the Emitter of Q17. Turning on the Vibra Harp or Vibes tab connects these pulses to the bulb in Photocell P1 causing the bulb to pulsate on and off. As the bulb pulsates, the resistance of the Photocell in P1 varies which allows signal from Q13 & Q14 to be pulsated through P1 creating the tremolo effect for these voices. (Turning on the Flute 16 tab with either of these voices will reduce the intensity of their tremolo). Turning on the Flute 16 tab applies a positive DC voltage to the bulb in Photocell P1 allowing signal from Q13 & Q14 to pass through P1 without a tremolo effect. Turning on the Leslie switch with Flute 16 lowers the DC voltage on the bulb and also connects the pulsating output of Q17 to the bulb. This combination of DC and pulsating voltage causes the signal passing through P1 to have only a slight tremolo effect.

NOTE: The Flute 16 voice is the only Flute voice that plays in both the Main & Leslie Channels. This is done to reinforce the Leslie at lower Flute 16 frequencies. Turning on the Leslie tremolo switch pulsates the Main Flute 16 signal through Photocell P1 giving it a tremolo effect.

Q20 & Q21 LESLIE PREAMPS

All upper and lower keyboard Flute signal is applied to the Leslie preamps where the signal is amplified before being routed to the Chorus Input Low-Pass Filter and the Leslie Mixing Preamp.

SCHEMATIC 3

UPPER KEYBOARD COLLECTOR AMPS, TABSWITCHING PREAMPS & MODULATOR

Audio signal from Reed/String Collector lines is routed via tabswitches to voicing circuits and preamps to create the various organ voices. Some signal is applied to the Percussion and Slow Attack Modulator for use on voices with a Percussive or Slow Attack character. The output of all these circuits is applied to the Main Preamp before being routed to the Chorus Input Low-Pass Filter and the Main Mixing Preamp.

Q28 & Q29 16-FOOT R/S COLLECTOR AMP & EMITTER FOLLOWER

Turning on the Cello, Oboe, Trombone, Hawaiian Guitar, Piano, Harpsichord, Banjo, Mandolin, Accordion, Harmonica or Auto Wow tabs removes the ground from the input of the 16-foot R/S Collector Amp Q28. This allows signal from the 16-foot R/S Collector line to pass to Q28 & Q29 where the signal is amplified and transformed to a low impedance signal. This signal is then routed via tabswitches to the Horn, Harpsichord, Banjo and Main Preamps. Turning on the Accordion, Banjo or Mandolin tabs also ungrounds the 16-foot Percussion Grounding Line opening the signal path from Q29 to the Percussion and Slow Attack Modulator. Signal is also routed to the Auto Wow and Harmonica Preamp Q71.

IC14 & Q27 PERCUSSION & SLOW ATTACK MODULATOR & EMITTER FOLLOWER

The Vibes, Mandolin, Banjo, Harmonic Flute, Accordion, Piccolo and Violin voices are the Percussion and Slow Attack voices of the organ. Turning on any of these voices performs two functions relating to Modulator IC14. The first function of these tabs is to allow signal to reach the input of the Modulator (Pin 3) from (depending on voice being played) the 16-foot R/S Collectors, Violin Collector Amp or 4-foot Percussion Collector Amp. The second function is to connect keying pulses from (depending on voice being played) the Percussion Modulator Driver, the Repeat Modulator Driver or the Slow Attack Modulator Driver to Pin 5 of Modulator IC14. These keying pulses connected to Pin 5 allow the signal to pass through IC14 and give it the Percussion or Slow Attack effect. The signal is then applied to the base of Q27 where it is transformed to a low impedance output signal before being routed, via the above-mentioned tabs, to various voicing circuits and then to the Main Preamp Q37.

Q30 HARPSICHORD PREAMP

Turning on the Harpsichord tabswitch allows audio signal from the 16-foot R/S Collectors to pass to the Harpsichord Preamp Q30. Here the signal is amplified and then routed to the Main Preamps. Audio signal from the Harpsichord arpeggio tab is also applied to Q30.

Q33 & Q34 BANJO PREAMPS

Audio signal from the Upper Keyboard Banjo, Oboe and Hawaiian Guitar and Lower Keyboard Guitar Bass, Banjo & Ukulele Strum tabswitches is amplified by the Banjo Preamps. The signal is then voiced at the output of Q34 before being applied to the Main Preamps.

Q35 & Q36 HORN PREAMPS

Audio signal from the Upper Keyboard Trombone, Hawaiian Guitar, Upper and Lower Keyboard Piano and Pedal Bass Guitar and Piano Arpeggio is amplified by the Horn Preamps. The signal is then voiced at the output of Q36 before being applied to the Main Preamps.

Q37 & Q38 MAIN PREAMPS

All Upper Keyboard R/S, Special Effect and 16-foot Main Flute signal, Lower Keyboard R/S signal and Pedal Guitar Bass signal is applied to the Main Preamps where the signal is amplified. This signal is then routed to the Main Amplifier and the Chorus Input Low-Pass Filter.

SCHEMATIC 4

LOWER KEYBOARD DIODE KEYING FILTERING & TABSWITCHING AND AUTO RHYTHM START

There are 44 Lower Keyboard accompaniment keyswitches. Pressing an accompaniment key applies positive voltage (through L16 to the anode of a diode D18, allowing audio signal from the tone generators to pass to the Accompaniment Modulator IC16 and Flute Collector Amp Q40. Turning on the Magic Genie Chord tabswitch disables the first twelve accompaniment keys (A1-G#1). The outputs from the Magic Chord R/S Preamp Q81 and Magic Chord Flute Emitter Follower Q83 (see Drawing 8) are then routed respectively to the Accompaniment Modulator IC16 and Lower Flute Volume Control VR6. With the Magic Chord tab on, the A2 accompaniment keyswitch becomes the 7th switch. Pressing the A2 keyswitch applies a positive voltage to the 7th Enable IC25C (see Drawing 8) which adds the 7th note to the Magic Genie Chord being played.

IC16, Q42 ACCOMPANIMENT MODULATOR & EMITTER FOLLOWER

Audio signal from the Lower Keyboard R/S Collector Line or Magic Chord R/S Preamp Q81 is applied to the input of Modulator IC16. Here the signal is amplified before being applied to the Accompaniment Emitter Follower Q42. Signal can only pass through the Modulator when a positive voltage is applied to Pin 5 from the Accompaniment Modulator Driver Q90. With no rhythm on, a steady positive voltage is applied to Pin 5 holding the Modulator on, allowing signal to pass through unmodulated. With a Rhythm Tabswitch on, positive voltage pulses are applied to Pin 5 from the Accompaniment Modulator Driver Q90, gating the signal through the Modulator at the speed (tempo) of the rhythm. Placing the Genie Voices tab in the + Organ position applies a steady positive voltage to Modulator IC16 allowing the accompaniment to play unmodulated when using a rhythm. The signal is then applied to the Accompaniment Emitter Follower Q42 where it is transformed to a low impedance output signal before being applied to various voicing circuits and the Main Preamp Q37 via the Accompaniment Tabswitches.

Q40 LOWER KEYBOARD FLUTE COLLECTOR AMP

Audio signal from the Flute Collector Line is filtered by the Lower Keyboard Flute filters (3L-5H). The signal is then collected together at the output of the filters and applied to the base of Q40. Here the signal is amplified before being sent via the Lower Keyboard Flute Volume Control VR6 to Q41 Lower Keyboard Flute Switcher. Audio signal from the Magic Chord Flute Emitter Follower Q83 is also applied through VR6 to Q41.

CIRCUIT DESCRIPTION

Q41 LOWER KEYBOARD FLUTE SWITCHER

The Lower Keyboard Flute Switcher is an N Channel FET which is gated off by a negative voltage at its gate. Turning on the Lower Keyboard Flute tabswitch removes the negative voltage causing the switcher to conduct, allowing the Flute signal to pass to the Leslie Preamps.

Q107 ACCOMPANIMENT KEYDOWN DETECTOR

The base of Q107 is normally high, keeping Q107 turned off. When an Accompaniment keyswitch is pressed, the base voltage is lowered and the transistor conducts applying a positive voltage to the Auto Start and Keyed Arpeggio circuits.

SCHEMATIC 5

BASS PEDALS

Pressing a bass pedal causes the following:

1) A pulse is developed across the .22 capacitor (connected to the C1 Pedal Switch) causing the Pedal Cancel Trigger to operate.
2) A generator output Diode D22 is biased on, allowing tone generator signal to pass through Diode D23 to the base of the Pedal Collector Amp Q50.
3) A 5.6 mfd capacitor is charged, which holds Diode D22 on after the pedal has been released.
4) The Pedal Keyer conducts applying a positive voltage to its Emitter Follower causing the Emitter Follower to conduct which allows signal from the Pedal Divider to pass to the Pedal Current Amp. The Pedal Keyer also delivers a positive pulse to the Horn Preamp if the pedal tabswitch is in the Guitar Bass position.

Q47 & Q48 PEDAL CANCEL TRIGGER

Pressing a pedal develops a pulse across the .22 capacitor connected to the C1 Pedal Switch. This momentarily lowers the voltage on the base of Q47 turning it off. When Q47 turns off, it applies a positive voltage pulse to the base of Q48; this causes Q48 to turn on, momentarily grounding the Pedal Keying Line which discharges any previously charged 5.6 uf pedal sustain capacitor. This turns off the signal path of the previously played pedal making sure that only the signal from the pedal being played enters the Pedal Divider. (If more than one signal at a time enters the Pedal Divider, rumble will occur.)

Q50 PEDAL COLLECTOR AMP

Audio signal from the Tone Generators is applied through a Diode D22 and D23 to the base of the Pedal Collector Amp each time a pedal is played. This signal is amplified to an amplitude sufficient for driving the Pedal Divider IC11.

IC11 PEDAL DIVIDER

Part of IC11 is used as the Pedal Divider. Audio signal is applied to the divider where it is divided in half. The output signal from the Pedal Divider passes to the Pedal Current Amp when Pedal Keyer Emitter Follower Q51 conducts and turns on Diode D27.

Q49 PEDAL KEYER

Playing a bass pedal applies a positive voltage through a Diode D24 simultaneously to the Emitter and Bass of the Pedal Keyer Q49. This causes Q49 to conduct applying a positive voltage to the base of Pedal Keyer Emitter Follower Q51. This voltage is also applied as a pulse to the anode of D29 allowing a short burst of signal to pass through D29 & D30 to the Horn preamp when the pedal tab is in the Guitar bass position. This short burst of signal creates the Guitar bass Harmonic.

Q51 PEDAL KEYER EMITTER FOLLOWER

Positive voltage from the Pedal Keyer is applied to the base of the Pedal Keyer Emitter Follower Q51. This causes Q51 to conduct applying a positive voltage to the anode of D27, allowing signal from the pedal divider to pass to the Pedal Amp, Q53. When Q51 conducts a positive voltage is also applied to the base of the Genie Bass Killer Q58. The positive voltage applied to the base of Q51 also charges the .22 capacitor there and with either the pedal sustain or the Pedal Guitar Bass/String Bass tab in the on position this capacitor discharges onto the base of Q51 holding it on momentarily. This allows signal from the pedal divider to pass to the Pedal Amp after the pedal has been released and gives the pedal sustain effect.

Q53 PEDAL CURRENT AMP

Audio signal from the Pedal Divider is applied to the base of the Pedal Current Amp where the audio signal is transformed to a low impedance signal. The output signal is then routed, via the bass volume tabs, to String Bass Preamp Q59.

Q58 LOWER KEYBOARD BASS KILLER

Q58 receives a positive voltage on its base from the Pedal Keyer Emitter Follower Q51 each time a pedal is played. This voltage causes Q58 to turn on which grounds the output of the Bass Keyer Emitter Follower Q96 cancelling the Lower Keyboard Bass until the pedal is released. This makes it possible to play the bass pedals at various intervals while the Lower Keyboard Bass is being used.

Q59 & Q60 STRING BASS PREAMPS

Audio signal from the Pedal Amp and the Bass Keyer Emitter Follower is applied to Preamp Q59 where it is amplified and voiced for proper tonality. The signal is then routed to Q60. Q60 amplifies the signal once more before being routed to the Main Preamps and to the Chorus Switch.

SCHEMATIC 6

UPPER KEYBOARD KEYING, AUTO WOW, HARMONICA, SLOW ATTACK & PERCUSSION KEYING

UPPER KEYBOARD KEYING

Pressing an Upper Keyboard Keyswitch F1-C4, applies a positive voltage (through a 10K and 33 ohm Resistor off the base of Q62) through Diodes D35, 36, 37 & D4 (see Drawing 1), while charging a 30 uf capacitor. The voltage applied through these Diodes allows signal from the Tone Generators to pass through to the 4, 8 and 16-foot Diode Keying Groups. The signal is then filtered and amplified before being applied to Upper Keyboard tabswitches where it is routed to various voicing circuits, preamps and then to the Main and Leslie Amps. Upon releasing a key, the 30 uf capacitor discharges, holding Diodes D35, 36, 37 & D4 on momentarily - creating a sustain effect. The rate at which the 30 uf capacitor discharges or the length of sustain, is controlled by altering the voltage on the base of the Sustain Length Regulator Q65.

NOTE: Schematic 6 shows a one-note example of Upper Keyboard diode keying. Each footage output shown has 44 identical circuits. Taking the 4-foot output as an example, there are (44) 47K, 68K and 6.8K resistors and Diodes D35. Six to seven-note Diode Keying Groups are then formed for filtering at the junction of each 68K and 6.8K resistor.

Q65 SUSTAIN LENGTH REGULATOR

The discharge rate of the 30 uf capacitor is controlled by the voltage applied to the base of Q65. As the voltage on the base varies, the length of sustain or discharge rate of the 30 uf capacitor varies. Only the sustain length contacts override the Custom Sustain Control VR3. The sustain length of all other Upper Keyboard voices is controlled by VR3.

NOTE: Mandolin and Banjos sustain length is controlled by VR3 when the Percussion tab is in the solo position.

Turning the Mandolin tab on, leaves the base of Q65 open, removing it from the circuit and giving the longest sustain. Turning the Banjo, Accordion, Piccolo or Violin tab on, applies ground to the base of Q65, causing it to conduct hardest, giving no sustain. Turning the Harpsichord tab on, applies positive voltage to the base of Q65 causing it to conduct, slightly giving a medium sustain effect. With the Piano tab on, the length of sustain is slightly longer because more positive voltage is applied to the base of Q65, by removing the 1.5K ohm resistor from the circuit. Turning on the Hawaiian Guitar, Vibra Harp and Vibes tabswitches, removes the 10K resistor from the circuit applying more positive voltage to the base of Q65, creating a longer sustain. When more than one of the Upper Keyboard preset sustain tabs are on, the sustain length of the voice located farthest to the left will dominate because of the series opening configuration of the sustain length contacts.

NOTE: A PNP transistor conducts when the base voltage is .6V lower than the emitter voltage. The more positive the emitter is, in relation to the base, the harder the transistor will turn on.

Q64 SUSTAIN CANCELLER

Pressing an Upper Keyboard keyswitch causes Q62, the Auto Wow and Slow Attack Keydown Detector, to conduct. This applies a positive voltage through Diode D32 to the sustain cancel tabswitch contacts (see Drawing 3). Turning on an Upper Keyboard voice containing one of these tabswitch contacts, connects the positive voltage from Q62 to the base of Sustain Canceller Q64. This voltage develops a positive pulse across the 10 uf capacitor and momentarily turns on Q64 each time a key is pressed. This momentarily grounds the sustain line which cancels the sustain of any previously played note, creating a monophonic or one-note sustain effect.

SLOW ATTACK

Placing the Harmonic Flute, Banjo, Mandolin and Vibes tabswitches in the off position, and either the Accordion, Piccolo or Violin in the on position, connects voltage output from the Slow Attack Modulator Driver Q63 to Pin 5 of the Percussion and Slow Attack Modulator IC14.

Q62 AUTO WOW & SLOW ATTACK KEYDOWN DETECTOR

Pressing an Upper Keyboard keyswitch lowers the voltage on the base of Q62, causing it to conduct. This applies a positive voltage through a 2.2M resistor and charges a .047 capacitor. The RC time constant of this capacitor and resistor cause a slowly rising voltage to appear on the base of the Slow Attack Modulator Driver Q63. Upon releasing a key, any remaining voltage in the .047 capacitor will discharge through Diode D33. Q62 also applies a positive voltage to the sustain cancel tabswitch contacts (see Circuit Description Q64 & Drawing 3), and the Auto Wow Keyer (see Q66).

Q63 SLOW ATTACK MODULATOR DRIVER

A slowly rising voltage is applied to the base of the Slow Attack Modulator Driver Q63, causing it to turn on slowly. This applies a steadily increasing voltage to the Percussion and Slow Attack Modulator IC14, gating the signal through it and creating the slow attack effect used for the Accordion, Piccolo and Violin voices.

NOTE: The slow attack effect is only present when the Banjo, Mandolin, Harmonic Flute and Vibes tabswitches are off. Turning on one of these voices overrides the slow attack effect and only the percussion effect is heard.

AUTO WOW

Pressing an Upper Keyboard keyswitch activates the Auto Wow keying circuitry. The purpose of the Keyer, Vibrato Delay Trigger, Shaper and Reset is to vary the voltage on the LED Driver by varying the discharge rate of the 1 uf capacitor at the collector of the Auto Wow Reset; thus giving the proper Auto Wow waveform.

Q66 AUTO WOW KEYER

Positive voltage from the collector of Q62 is applied to the base of the Auto Wow Keyer Q66 each time a key is pressed. This develops a positive pulse across the .1 capacitor, causing Q66 to conduct, which momentarily lowers the voltage on the bases of the Vibrato Delay Trigger Q67 and the Auto Wow Reset Q69.

Q67 VIBRATO DELAY TRIGGER

The voltage on the base of Q67 is momentarily lowered, causing it to turn off. This applies a positive voltage pulse to the base of Auto Wow Shaper Q68. A positive voltage pulse is also applied to the Vibrato Delay Switcher Q1 (see Q1) via the vibrato delay tabswitch contacts (see Drawing 3).

Q69 AUTO WOW RESET

A positive voltage applied to the base of the Auto Wow Keyer Q66 from the Auto Wow and Slow Attack Keydown Detector Q62, causes Q66 to conduct. This develops a pulse across the .05 capacitor at the base of Auto Wow Reset Q69, causing it to conduct, charging the 1 uf capacitor at its collector. This is done to insure the 1 uf capacitor is fully charged each time a key is pressed.

Q68 AUTO WOW SHAPER

Positive voltage pulses are applied to the base of Q68 from the Vibrato Delay Trigger Q67, each time an Upper Keyboard key is pressed. This causes Auto Wow Shaper Q68 to conduct, discharging the 1 uf capacitor at its collector. This applies a voltage of varying amplitude to the base of the LED Driver Q70 when the Harmonica tab is in the off position.

Q70 LED DRIVER

The LED Driver Q70 has voltage applied to its base from the Auto Wow keying circuitry or the Vibrato Oscillator, depending on the position of the Harmonica tabswitch. (If Auto Wow and Harmonica are both on, Harmonica will override Auto Wow.) The voltages applied to the LED Driver causes it to conduct, applying a varying voltage to the light-emitting diode in Photocell P2. This causes the photocell's resistance to fluctuate, thereby varying the circuit output and giving the Harmonica or Auto Wow effect.

Q71 AUTO WOW & HARMONICA PREAMP

Audio signal from the 16-foot R/S Emitter Follower Q29 is applied to the base of this preamp. The Harmonica and Auto Wow preamp is a variable tuned circuit that amplifies only audio signals at the frequency which it is tuned. The frequency range of Q71 is adjusted by Photocell P3. The output of the Auto Wow and Harmonica preamp is then connected to the Main Preamp Q37.

Q72 EMITTER FOLLOWER

This circuit determines the frequency that the Auto Wow and Harmonica preamp is tuned by electrically changing the effective value of the .01 uf capacitor attached to its emitter.

PERCUSSION

Turning on the Vibes tab or the Mandolin, Banjo or Harmonic Flute tabs with the Percuss tab in the solo position, connects a positive voltage pulse from the Percussion Modulator Driver Q74, to Pin 5 of the Percussion and Slow Attack Modulator IC14, each time an Upper Keyboard key is pressed.

Q73 & Q74 PERCUSSION KEYDOWN DETECTOR & MODULATOR DRIVER

Pressing an Upper Keyboard key develops a pulse across the 1 uf capacitor at the base of Q73. This momentarily lowers the voltage on the base of Q73, causing it to turn off. When Q73 turns off, it applies a positive voltage from its collector to the base of the

Percussion Modulator Driver Q74, causing it to turn on applying a positive voltage pulse via the Percussion and Slow Attack contacts (see Drawing 3), to the Percussion and Slow Attack Modulator IC14. This causes audio signal to be gated through IC14 for the length of the pulse, giving the percussion effect to these Upper Keyboard voices.

SCHEMATIC 7

CHORUS

Audio signals from the Main and Leslie Preamps are applied to the Chorus Input Low-Pass Filter where high frequency audio is filtered out. The Bucket Brigade phase modulates the audio at the rate of the Voltage Controlled Oscillator clock causing a delay between the input and output signals. The Chorus Output Low-Pass Filter removes the high frequency clock component of the Voltage-Controlled Oscillator. When the Chorus switch is in the on position, the output of the Chorus Output Low-Pass Filter is ungrounded. The Phase Modulated Audio is mixed with unmodulated audio signal at the Main Mixing Preamp. The signals applied to the Main and Leslie Mixing Preamps are outputted to their respective power amps.

IC22A&B AND Q77 & Q78 CHORUS SPEED AND VOLTAGE-CONTROLLED OSCILLATORS

The Chorus Speed Oscillator produces a .7Hz triangular waveform at the output of IC22B. The voltage-controlled oscillator runs at a speed which is inversely proportional to the amplitude of the input from the speed oscillator. Since the amplitude of the input from the speed oscillator is constantly changing, the frequency of the voltage controlled oscillator varies. This in turn varies the delay time of the audio signal through the bucket brigade resulting in a phase modulated signal.

IC21A CHORUS INPUT LOW-PASS FILTER

Audio signals from the Main and Leslie Preamps are applied to the Chorus Input Low-Pass Filter. The input Low-Pass Filter prevents intermodulation by filtering out certain high frequency signals. The output of this filter is then applied to the input of the Bucket Brigade.

IC20 BUCKET BRIGADE

The Bucket Brigade is an analog shift register which samples the input audio signal at the rate of the Clock pulses from the Voltage-Controlled Oscillator. Each time a negative clock pulse is applied to Pin 5 and then Pin 2 of IC20, the audio signal is transferred to the next stage of the Bucket Brigade until it appears as output at Pin 6. This causes a delay between the input and output signal. Since the frequency of the clock pulses are constantly varying, the delay time of the signal through the Bucket Brigade also varies, phase modulating the audio. The audio signal output from the Bucket Brigade is then applied to the low pass filter.

IC21B CHORUS OUTPUT LOW-PASS FILTER

The output Low-Pass Filter filters out the high frequency clock component that is contained in the audio signal at the output of the Bucket Brigade. When the Chorus switch is turned on, the output of the Output Low-Pass Filter is ungrounded which applies phase modulated audio to the Main Mixing Preamp.

IC23A, IC23B MAIN AND LESLIE MIXING PREAMPS

The Chorus switch controls the signals applied to the Main and Leslie Mixing Preamps. When the Chorus switch is off, the output of the Output Low-Pass Filter is grounded. The signals from the Main and Leslie Preamps are routed to their respective mixing preamps. The String Bass signal is routed to the Leslie Mixing Preamp.

Placing the Chorus switch on changes the level of the Main and Leslie signals to compensate for the signal outputted from the Output Low-Pass Filter. The Chorus signal is applied to the Main Mixing Preamp. String Bass signal is rerouted to the Main Mixing Preamp. Applied to the Main and Leslie Mixing Preamps is signal from the Rhythm Output Amp. Each mixing preamp mixes and amplifies the signals applied to it. The output signal is routed via photocells to the Main and Leslie amplifiers. (See Schematic 10.)

SCHEMATIC 8

CHORD FUNCTION GENERATOR [CFG]

CHORD FUNCTION GENERATOR IC26

The Chord Function Generator IC26 (CFG) contains a keyboard scanning system, five programmable frequency generators and the required logic to provide four output features which are bass, chord, strum and arpeggio. The keyboard scanning system is capable of scanning 72 time points on a sequential basis. The scan matrix is partitioned in a 12 (X scan) by 6 (Y scan) array. Sequential pulses are outputted on the 12 X lines and a particular time point is active when one of the X lines is connected to one of the Y lines. In the non-chord mode (Magic Genie Chord tab off) the bass feature is the only function that is enabled. In this mode of operation bass signal is outputted from Pins 6 & 7 of the CFG. In the chord mode (Magic Genie Chord tab on) circuitry is enabled to add data bits. These bits correspond to the notes in the chord being played. For example, if a chord is being played there will be data bits at 3 of the 72 time points. If the A2 Key (which is the 7th switch) is pressed a fourth data bit is added to the chord, pressing the minor footswitch shifts the data at one of the time points creating the minor of the chord being played. The minor and 7th of the chord reset with each new keydown. The other features of the chip, strum and arpeggio, can also be enabled when the chip is in the chord mode. All the features are outputted when a key is pressed. The chord hold function is enabled whenever the Magic Chord tab is on. This causes the chord data to latch and continue outputting the features after a Magic Chord key is released.

Q80 CHORD FUNCTION MASTER OSCILLATOR

Q80 develops a continual high frequency signal that is applied to five programmable frequency generators via Pin 24 of the CFG IC26. The programmable generators are each capable of generating one of 12 frequencies, dependent on the address code provided them. These generators supply the audio signal for the Magic Chords, Strum and Arpeggio features in the chord mode of the CFG. If a vibrato preset is on, the features that are outputted will have a vibrato effect, unless a rhythm tab is on. In this case, the output from the vibrato oscillator is grounded, cancelling vibrato of the Lower Keyboard features.

MAGIC GENIE CHORDS

There are 28 Lower Keyboard bass keyswitches. The first 12 of these are also Magic Chord Keyswitches. Turning on the Magic Chord tabswitch disconnects Pin 21 from Pin 29 of the CFG IC26. This puts the CFG in the chord mode of operation. Pressing a Magic Chord keyswitch (A1-G#1) connects a Y scan line to an X scan line, causing data bits to appear at three CFG time points. These data bits provide the address code for the programmable frequency generators, causing three audio frequencies that form a specific chord to be outputted at Pin 5 of the CFG. These audio signals are then applied to the Magic Chord R/S Preamp Q81 and the Magic Chord Flute Filter IC27A&B. Q81 amplifies the audio signal before being routed to the Accompaniment Modulator IC16. The signal applied to IC27A&B is voiced for proper Flute tonality and routed through Q83 to the Lower Flute Volume Control. Turning on the Magic Chord tab also disables the A2 Accompaniment keyswitch, shown on Drawing 4, which now becomes the 7th switch. Pressing this key adds the 7th component to the chord being played. NOTE: In the Magic Chord mode of operation, only the highest chord being played will sound.

7TH & MINOR ENABLE

With Pin 1 of IC25C held low, IC25C appears as an inverter and its output at Pin 3 is the inverted input of the X Scan Line from Pin 26 of IC26. Because only one X Scan Line is active at a time, the inputs on Pins 12 & 13 of IC25A can either be opposite or both low. When Pin 26 of IC26 goes low, Pin 3 of IC25A goes high and, since Pins 12 & 13 must be opposite, Pin 11 of IC25A goes low. In effect, the X Scan output from Pin 26 has been connected through IC25C&A to the Y Scan Line from Pin 21, and when Pin 26 goes low it activates the 7th time point of the CFG chip. This is the condition of the CFG chip when the 7th component of the chord is not being played. To enable the 7th component to play the X & Y Scan Lines must be momentarily disconnected. This is accomplished by the following: Turning on the Magic Chord tabswitch connects the A2 accompaniment keyswitch (shown on Drawing 4) to Pin 1 of IC25C. Pressing the A2 keyswitch at this time causes Pin 1 of IC25C to go high which in turn causes a low on Pin 3 and a high on Pin 11. With Pin 11 held high, the Y Scan Line from Pin 21 does not feel the negative transition of the X Scan Line from Pin 26. This deactivates the 7th time point and adds the 7th component to the chord being played.

The Minor Enable operates in the same manner, using the X Scan output from Pin 27 of the CFG and Minor Enable IC25B. The minor is enabled by pressing the minor footswitch which is located to the right on the expression pedal.

STRUM KEYING

Holding a chord keyswitch with the Magic Chord tabswitch on outputs the frequencies of the chord being played on the four strum output frequency lines, Pin 1, 2, 3 & 40. If the Ukulele tab is on, Pin 32 of the CFG is disconnected from Pin 21 of the CFG and the frequencies outputted on Pins 1, 2, 3 & 40 will be of a higher octave. Each time a pulse is applied from IC30 Pin 19 to Pin 15 of the CFG, a sequence of pulses is triggered and outputted on the four strum keying lines, Pins 8, 9, 10 & 11. The strum speed is determined by the frequency of rhythm clock pulses applied to Pin 14 of the CFG. When the Slow Pick tab is on, the rhythm clock pulses will be frequency divided-by-two resulting in a slower strum speed. The first keyer pulse appears on the root keying line then the 3rd, 5th & 7th. If the 7th of the chord is not enabled (see 7th Enable), the sequence will not include a pulse on Pin 8 for the Strum 7th signal. The pulses on the four keying lines are applied to the anodes of Diodes D93, 96, 97 and 99, turning them on, allowing audio signal on the four strum signal lines to pass to the Strum Preamp Q82. Here the signal is amplified and routed via either the Guitar or Ukulele strum tabs to various voicing circuits and the Main Preamp Q37.

ARPEGGIO KEYING

Turning on the Piano or Harpsichord Arpeggio tab disconnects Pin 21 of the CFG from Pin 25 of the CFG and with the Magic Chord tab on, enables the internal arpeggio shift register. Pulses are applied to the shift register from one side of the internal arpeggio clock oscillator. The shift register advances with every other transition of the clock and generates a keying pulse which appears on Pin 13 of the CFG. The internal arpeggio clock is triggered by pulses applied to the CFG Pin 12 from the Arpeggio Trigger IC42D. The shift register also addresses a multiplexer which has as its input 3 octaves of root, 3rd and 5th frequencies of the Magic Chord being played. The output of the Multiplexer passes through some gating and appears on the arpeggio signal line, Pin 39 of the CFG. A different frequency is outputted on Pin 39 each time the shift register advances. When a keyer pulse is present on Pin 13, D101 is turned on allowing the audio signal on Pin 39 to pass to the Arpeggio Preamp Q84. Here the signal is amplified and routed through the Piano or Harpsichord tabs to various voicing circuits. (See Arpeggio Triggering.)

NOTE: The Arpeggio feature of the CFG will be outputted only when the rhythm is being played.

To enable arpeggio signal to pass through the Arpeggio Preamp, the Keyed Arpeggio Driver Q85 must conduct. When the Magic Chord tab is on, the base of Q85 is ungrounded. With the Keyed Arpeggio tab off and a rhythm tab on, a steady positive voltage will be applied from the Rhythm Tab On Line to the base of Q85 causing it to conduct. This enables the Arpeggio signal to pass through Q84. When the Keyed Arpeggio tab is pressed, the arpeggio signal present at the base of Q84 will be outputted only when a lower keyboard key is pressed and held.

ARPEGGIO TRIGGER

Clock pulses from the Clock Multivibrator are applied to Pin 5 of IC36A Arpeggio Clock Select. When the Rhythm Select switch is in the Track A position (Triplet, Waltz), Pin 6 of IC36A will be high enabling Rhythm Clock pulses to pass to Pin 4 of IC36A. Clock Multivibrator pulses which are frequency divided-by-two are applied to Pin 8 of IC36A. When the Rhythm Select switch is in the B or C positions (4/4 rhythms) IC36A Pin 9 will be high enabling pulses applied to Pin 8 of IC36A to pass to Pin 4.

Applied to Pin 13 of the Arpeggio Trigger IC42D is a positive voltage. Each time Pin 4 of IC36A goes low, a negative going pulse is developed across the .047 uf capacitor which applies IC42D Pin 13 low. If a rhythm is on, Pin 12 of IC42D will be high, enabling IC42D. Each time Pin 13 goes low, a positive pulse will be outputted from IC42D Pin 11. This pulse is inverted by the Arpeggio Pulse Shaper IC25D and applied to the CFG Pin 12.

HIGH/LOW BASS

With the Magic Genie Chord tabswitch off, the only feature of the CFG chip that is outputted is the High/Low Bass. In this mode of operation, holding down two or more lower keyboard keyswitches (A1-C3) causes the following: audio signal corresponding to the highest note being played is outputted from Pin 6 of the CFG and audio signal corresponding to the lowest note being played is outputted from Pin 7 of the CFG. The high bass signal is routed to Pin 13 of the High/Low Bass Select IC33B and the Low bass signal is routed to Pin 2 of IC33B. (See Bass Keying.)

ROOT/FIFTH BASS

With the Magic Genie Chord tabswitch on, the bass feature of the chip is in the Root/Fifth mode of operation. If a Magic Genie Chord (one-note chord) is held at this time, the audio signals at the bass root output (Pin 7) and bass 5th output (Pin 6) are the root and 5th components of the chord being played. The 5th bass signal is routed to Pin 13 of IC33B. The root bass signal is routed to Pin 2 of IC33B. (See Bass Keying.)

IC33B, IC37B HIGH/LOW BASS SELECT, DIVIDER

The High/Low Bass Select IC33B has as its inputs at Pins 2 & 13 the High/Fifth Bass and the Low/Root Bass from Pins 6 & 7 of the CFG IC26. With all rhythms off, Pin 1 of IC33B is held positive and Pin 12 is held low. This enables only the Low/Root Bass signal to be outputted from IC33B. Turning on a rhythm tab causes the inputs at Pins 1 & 12 to alternately switch high and low. The audio output at Pin 3 of IC33B will now be an alternating high/low signal. The audio signal applied to IC37B is frequency divided in half then applied to the Bass Keyer.

NOTE: When the Boogie Bass tab is on, the Boogie Bass audio is applied to Pins 2 & 13. This ensures a signal output at Pin 3 of IC33B no matter what state the RFG Bass Select (IC30 Pin 25) is in.

BASS KEYING

Rhythm Off

When the rhythm tabs are off, Pin 1 of IC33B is high enabling the low/root bass audio to pass to the Bass Keyer Q94. A steady positive voltage applied to Q94 via Diode D141 allows the bass signal to pass to the Emitter Follower Q96. The Emitter Follower outputs the bass audio as a low impedance signal which is applied to the String Bass and the Bass Guitar tabs.

Rhythm On

The bass triggering source is determined by the position of the Boogie Woogie Bass tabswitch. The Bass Trigger Select IC36B has, as its input at Pin 12, bass trigger pulses from the RFG IC30 Pin 19 which correspond to the selected rhythm pattern. The input at Pin 2 is a sequence of trigger pulses from the Boogie Bass Trigger IC42C.

Pressing a rhythm tab causes the following:

1) The voltage applied to Q94 via D141 is removed.
2) A positive pulse is applied from the keydown Bass Trigger Q92, through D139 to the Bass Driver Q95. This causes Q95 to momentarily turn on applying a positive pulse to Q94 to ensure a bass audio tone is heard at the rhythm downbeat.
3) Positive pulses are applied to the base of Q95 from the Bass Trigger Select IC36B and IC32E. Each pulse applied to Q95 will gate the bass audio through the Bass Keyer Q94 to the Emitter Follower Q96.

NOTE: If the Magic Chord switch is off and the Boogie Bass tab is on, the High/Low bass will be gated through Q94 by the Boogie Bass Trigger circuit.

BOOGIE WOOGIE BASS ENABLE

Turning on the Magic Chord tab and the Boogie Woogie Bass tab causes the following conditions:

1) The X Scan Line from Pin 30 of the CFG is connected to the Y Scan Line at Pin 21 of the CFG. This activates the CFG time point for the Boogie Woogie bass pattern.
2) Positive voltage is applied to Pin 1 of IC36B. This enables pulses from the Boogie Bass Trigger IC42C to pass to the Boogie Bass Advance input of the CFG Pin 37.
3) The High/Fifth output of the CFG, Pin 6, is grounded through contacts of the Boogie Woogie and Magic Chord tabswitches.
4) Low/Root bass output (Pin 7 of the CFG) is applied to Pins 2 and 13 of IC33B High/Low Bass Select through contacts of the Boogie Bass and Magic Chord tabswitches. This ensures a signal output at Pin 3 of IC33B no matter what state the RFG Bass Select (IC30 Pin 25) is in.
5) When a rhythm tab is turned on, the X Scan Line from Pin 31 is disconnected from the Y Scan Line at Pin 21 of the CFG. This enables Pin 7 to output the Boogie Bass sequence.

NOTE: When Pin 31 is connected to Pin 21, Pin 7 of the CFG is locked in the Low/Root position.

Under the above conditions, 5 signals are multiplexed to the bass Low/Root output, Pin 7 of IC26. The multiplexer is controlled by a shift register. Each time a bass advance pulse is applied to Pin 37 of the CFG, the shift register advances one position and outputs the next signal in the bass sequence. The signal is outputted at Pin 7 of IC26, then routed through the Boogie Bass and Magic Chord tabs to Pins 2 & 13 of the High/Low Bass Select IC33B. If a new keydown occurs before the bass sequence is complete, the shift register will reset to the starting point.

BOOGIE BASS TRIGGERING

The Boogie Bass Triggering circuitry consists of several flip-flops which divide clock pulses from the Clock Multivibrator to provide trigger pulses for the Boogie Woogie Bass. When the Ballad is on, the Boogie Bass pulses occur at the clock frequency divided-by-twelve. The other Track A Boogie Bass pulses occur at the clock frequency divided-by-six. The Boogie Bass pulses for the Track B&C rhythm patterns occur at the Clock frequency divided-by-eight.

IC40A, IC37A DIVIDERS

The Q-bar output of IC40A is tied to its D input making IC40A a divide-by-two divider. IC37A is a divide-by-two divider. Pulses from the Clock Multivibrator are applied to IC40A and are frequency divided-by-two. The Q output of IC40A is applied to the clock input of IC37A. The resulting Q-bar output at IC37A Pin 2 is the Clock Multivibrator frequency divided-by-four.

NOTE: When the Downbeat reset pulse occurs, the Q output sets high and the Q-bar output is set low. This establishes the initial starting point for the bass triggering sequence.

IC35A, IC42A BOOGIE BASS CLOCK SELECT, BALLAD CLOCK ENABLE

The Boogie Bass Clock Select IC35A has as its input at Pin 2, the divided-by-two Clock Multivibrator frequency. Inputted on Pin 13 of IC35A is the divided-by-four Clock frequency. Pin 1 of IC35A is normally high enabling the divided-by-two clock to be applied to IC39A and IC39B. When the Ballad rhythm is used, Pins 5 and 6 of IC42A will both be high, locking Pin 4 low. This is inverted by IC34C and enables the divided-by-four clock to be applied to IC39A and IC39B.

IC35B, IC42B, IC39A & IC39B DIVIDE-BY-THREE, DIVIDE-BY-FOUR FLIP-FLOPS

Divide-by-Four

When the Rhythm Select switch is in the Track B or Track C position (4/4 rhythms), the J input of IC39A is locked high (due to the low state at IC42B Pin 1). Because the J and K inputs are both high, IC39A functions as a divide-by-two divider. The Q output will change states with each clock pulse applied to Pin 13. Pin 6 of IC35B will be high (due to the low state of the Clock Select Line). This connects the Q output of IC39A through IC35B and the Inverter to the K input of IC39B. The J and K inputs to IC39B will follow the Q output of IC39A. Clock pulses applied to IC39B will cause the Q output to change states when the J and K inputs to IC39B are high. The Q output of IC39B is the divided-by-four frequency of the pulses applied to the clock inputs of IC39A and B. The result is that the pulses applied to the Boogie Bass Trigger IC42C is the divided-by-eight Clock Multivibrator frequency.

NOTE: When the Downbeat Reset pulse occurs, the Q outputs of IC39A and B are reset low to establish the initial starting point for the Boogie Bass triggering sequence. (See Truth Table.)

Divide-by-Three

When the Rhythm Select switch is in the Track A position (Waltz, Triplet rhythms), positive voltage is applied to the Clock Select Line. This sets up the following conditions for the J-K flip-flops to output one pulse for each three applied to IC39A&B:

1) Positive voltage applied to IC42B Pin 1 enables the Divide-by-Three Enable to invert the input at Pin 2.
2) IC35B Pin 6 is applied low disconnecting the Q output of IC39A from the K input of IC39B.
3) IC35B Pin 9 is applied high which connects the Q-bar output of IC39A to the K input of IC39B.
4) Positive voltage is applied to Pin 6 of IC42A. If the Ballad rhythm (Rhythm 1) were on, Pin 5 of IC42A would be high. This would cause IC35A Pin 1 to switch low and Pin 12 to switch high applying divided-by-four Rhythm Clock pulses to the J-K Flip-Flops.

When a rhythm is started, a Downbeat Reset pulse sets the Q-bar outputs of IC40A and IC37A low and resets the Q outputs of IC39A and IC39B low. The low at the Q output of IC39B is applied to Pin 2 of IC42B causing its output to apply a high to the J input of IC39A. At this time, the J and K inputs to IC39A will be high, the J input to IC39B will be low and the K input to IC39B will be high. When the first clock pulse is applied to IC39B, the Q output will remain low due to state of the J and K inputs. Because the J and K inputs to IC39A are high, the first clock causes the Q output to switch high and the Q-bar output to switch low. This causes the J input to IC39B to switch high and the K input to switch low. The second clock applied to IC39A&B causes the Q output of IC39B to switch high (due to the condition of its J and K inputs). The second clock also causes the Q and Q-bar outputs of IC39A to change states again (Q low, Q-bar high). The high level from the Q output of IC39B is applied to the input of IC42B. Both inputs to IC42B are now high switching its output low. This low is applied to the J input of IC39A locking the Q output of IC39A in a low state. On the third clock, the Q output of IC39B switches low (because the J input is now low and the K input is high). The outputs of IC39A do not change states. The low Q outputted by IC39B is inverted by IC42B and applies a high to the J input of IC39A. The fourth and succeeding clock pulses are repetitions of the first three as described above. For each three clock pulses applied to IC39A&B, one pulse is outputted from IC39B Pin 1. (See Truth Table.)

IC42C BOOGIE BASS TRIGGER

When a rhythm is started, positive voltage from the Q output of the Rhythm On Detector is applied to Pin 9 of the Boogie Bass Trigger IC42C. This allows pulses from IC39B Pin 1 to be inverted and pass to the output of IC42C. Each time Pin 10 switches high, a positive pulse is developed across a .1 uf capacitor. This pulse is applied to the Boogie Bass advance input of the CFG and to the Bass Trigger Select IC36B. If the Boogie Bass tab had been on, the Boogie Bass Trigger pulses would be applied to the Bass Driver Q95.

IC33A RHYTHM CLOCK INVERTER

Pulses from the Rhythm Clock Multivibrator are frequency divided-by-two and applied to the input of the Rhythm Clock Inverter IC33A. (The divided-by-four input to IC33A is not used and is disabled by grounding Pin 8 of IC33A). The output, Pin 4 of IC33A is routed to the clock input of the Rhythm Function Generator IC30 Pin 6 and applied to the Rhythm On Detector IC44A.

RHYTHM START/STOP

The rhythm can be started normally by turning on a Rhythm switch or automatically by 1) placing the Rhythm Start Normal/Auto tab to Auto, 2) turning on a Rhythm switch and 3) pressing an Accompaniment keyboard key. The rhythm pattern will then stop automatically after all Accompaniment keys are released.

Normal

The initial conditions are as follows when the Rhythm Start tab is in the Normal position (before a rhythm tab is pressed):

1) Positive voltage is applied to Pin 12 of IC43B keeping its output, Pin 11, high which reverse biases D157. Pin 11 also applies positive voltage through D148 to the on buss of the Genie +Organ tabswitch. This allows the Lower Keyboard Reed/String voices to play. Q93 will be turned on allowing the Lower Keyboard Flute voice to play.

2) The output of the Inverter IC32D Pin 4 is high with the Rhythm tabs turned off. This high is applied via Diode D141 to the Bass Keyer Q94 and to the on buss of the Genie +Organ tabswitch via Diode D147.

3) The D input to IC44A is low causing the Q output to remain low. The collector of Q91 is high which disables the Rhythm Function Generator.

Turning on a rhythm tab causes the following to occur:

1) Pin 4 of the Inverter IC32D switches low, removing voltage from Diodes D147 and D94. Trigger pulses applied to Bass Driver Q95 will now gate the Bass audio signal through Q94.
2) Positive voltage is applied from the Rhythm Tab On line to the D input of IC44A (because Diode D157 is reverse biased). On the first clock pulse after the D input goes high, the Q output switches high. This enables the Boogie Bass Trigger IC42C and the Arpeggio Trigger IC42D. The collector of Q91 switches low which enables the Rhythm Function Generator and a negative going pulse is developed across a .01 uf capacitor which turns on Q92 momentarily. A positive pulse is outputted at the collector of Q92 resetting the Boogie Bass Dividers and triggering the Bass audio (via D139) at the initial downbeat. A rhythm pattern will be outputted as long as a rhythm tab is on.

Auto Start/Stop

When the Rhythm Start tab is in the Auto position and a Rhythm tab is on, the initial conditions are as follows:

1) Pin 4 of the Inverter IC32D is low. This removes voltage from the Bass Keyer Q94 preventing the Bass Audio signal from being outputted. The voltage path through D147 to the on buss of the Genie +Organ tabswitch is low.
2) A low is applied to the reset input of IC44B via IC43A and contacts of the Auto Start switch. The Q output of IC44B will remain low.
3) Pins 12 and 13 of IC43B Auto Start Trigger will be low causing the output at Pin 11 to be low. This low is applied to Pin 6 of IC43D Auto Stop Bass Reset which connects the X Scan output at Pin 31 of the CFG to the Y Scan at Pin 21. If the Magic Chord and Boogie Bass tabs were on, the internal Boogie Bass multiplexer would be locked in the root position. The Low/Root note will be outputted from Pin 7 of the CFG. The low from IC43B Pin 11 is applied to Pin 9 of IC43C which connects the X Scan output at Pin 28 of the CFG. This disables the Chord Hold function of the CFG if the Magic Chord tab is on.
4) Because IC43B Pin 11 is low: a) the positive voltage from the Rhythm Tab On Line is applied through D157 to Pin 11 of IC43B, keeping the D input to IC44A low, and 6) voltage is prevented from reaching the on buss of the Genie +Organ tab and the Auto Stop Flute Killer Q93, disabling the Lower Keyboard voices.

Under the above conditions, no rhythm, accompaniment or bass will be heard.

Pressing an Accompaniment Keyswitch causes the following:

1) Positive voltage is applied from the Accompaniment Keydown Detector to the Set input of IC44B causing the Q output to switch high.
2) The output of IC43B Pin 11 switches high. This high is applied to Pin 6 of IC43D locking Pin 4 of IC43D high which disconnects the X Scan at Pin 31 of the CFG from the Y Scan at Pin 21. This enables the Boogie Bass sequence to be outputted from the CFG if the Magic Chord and Boogie Bass tabs are on. Positive voltage applied to Pin 9 of IC43C disconnects the X Scan at

Pin 28 from the Y Scan at Pin 21. This enables the Chord Hold Function if the Magic Chord tab is on. Diode D157 becomes reverse biased.

3) The D input to IC44A goes high (due to the reverse biased condition of D157). On the first clock pulse after the D input switches high, the Q output of IC44A switches high. This enables the Boogie Bass Trigger IC42C and the Arpeggio Trigger IC42D. The collector of Q91 switches low which enables the RFG.

A negative going pulse is developed across a .01 uf capacitor which turns on Q92 momentarily. A positive pulse is outputted at the collector of Q92 resetting the Boogie Bass Dividers and triggering the Bass audio at initial keydown. The rhythm, accompaniment and bass will continue to be outputted as long as an Accompaniment Key is pressed.

The enable input to the Rhythm Function Generator (Pin 26 of IC30) is an in/out port. When Pin 26 is applied low, the RFG is enabled. With each downbeat, Pin 26 of the RFG outputs a negative sync pulse.

When the Accompaniment Keys are released, the rhythm will continue to play. (If the Magic Chord tab were on, the chords and bass would also continue to play.) When the rhythm sequence reaches the downbeat, a negative sync pulse is outputted from Pin 26 of the RFG and applied through a .01 capacitor to the base of Q92. The collector of Q92 outputs a positive pulse which is applied via IC43A to the Reset input of IC44B. Because the Set input to IC44B is low (due to the release of the Accompaniment Keys), the Q output resets low. This stops the rhythm by applying a low to the D input of IC44A via D157. This low is clocked to the Q output of IC44A and disables the Boogie Bass Trigger IC42C, the Arpeggio Trigger IC42D and the RFG. The Chord Hold Function of the CFG is disabled by connecting Pin 28 of the CFG to Pin 21 via IC43C and the Boogie Bass multiplexer is reset to the Root position by connecting Pin 31 to Pin 21 through IC43D.

REPEAT KEYING

Q106 REPEAT MODULATOR DRIVER

The negative going edge of the divided-by-two output of IC40A develops negative pulses across a .01 uf capacitor. These pulses are inverted by IC34A and applied as positive pulses to the base of Q106. This repeatedly turns on Q106 creating a series of positive output pulses at its emitter. These positive output pulses are then routed to Pin 5 of the Percussion Modulator IC14 where they gate signal through the modulator at the speed of the rhythm and create the repeat effect for the Mandolin and Banjo voices.

SCHEMATIC 9

RHYTHM CLOCK AND INSTRUMENTATION

IC32A, IC32B CLOCK MULTIVIBRATOR

The Clock Multivibrator oscillates at a speed which is controllable from approximately 6 to 90 Hz. The rectangular wave output is applied to a divider where the Clock Multivibrator speed is frequency divided-by-two. The divided-by-two clock pulses are applied to the clock input of the Rhythm Function Generator (RFG) IC30.

IC30 RHYTHM FUNCTION GENERATOR

The Rhythm Function Generator (RFG) IC30 is the source of all Rhythm, Alternating Bass and Accompaniment Keyboard Modulator timing pulses. The RFG is enabled by applying a low to Pin 26 (see Rhythm Start/Stop, Schematic 8). Pressing a Rhythm tabswitch applies a positive voltage to the RFG. This enables the logic sequence for the rhythm chosen. The Rhythm Select switch performs three functions:

1) It determines the Rhythm pattern that will be heard with a particular Rhythm by selecting the track that the logic sequence will follow.
2) It reduces the Clock Multivibrator speed for the Track A patterns by placing a .015 uf capacitor in parallel with the .047 uf feedback capacitor.
3) It provides a ground path for the capacitors located at the bases of the Brush and Cymbal Keyers to determine the Brush and Cymbal length.

The outputs of the RFG are positive pulses which are applied to the Instrumentation, Bass and Accompaniment Keyboard Modulator circuits. Track A patterns 1 through 4 are triplet rhythms (24 time points). Patterns A5 and A6 are 3/4 rhythms (18 time points). All other rhythms are in 4/4 time (32 time points). (See Rhythm Patterns Diagram.)

INSTRUMENTATION

The Instrumentation circuits produce the instrument voices for the rhythm. The generator circuits are tied together at their output and applied to the rhythm preamp where the voices are amplified and sent via the rhythm volume control to the output preamp.

IC38, IC41, IC45 RHYTHM GENERATORS

The Rhythm Generators are tuned resonant circuits. Positive pulses from the Rhythm Function Generator cause the circuits to generate short bursts of audio oscillation with diminishing amplitudes. The outputs of the Rhythm Generators are combined and applied to the Rhythm Preamp IC41D.

IC31 NOISE GENERATOR

The Noise Generator produces a random noise signal which is applied to the cathodes of Diodes D149, 151 and 152. When the Snare, Brush or Cymbal Keyer circuits operate, this signal is passed through D149, 151 or 152 to the Snare, Brush or Cymbal Voicing circuits.

Q101, 104, 105 SNARE KEYER, SNARE VOICING

Positive pulses from Pin 5 of IC30 are applied to the High Drum and Low Drum generators causing them to oscillate producing the High and Low Drum voices. These audio signals are then combined and routed to the rhythm preamp. Pin 5 also applies a positive pulse to the base of Q101, Snare Keyer, turning it on. This causes positive voltage to turn on Diode D152 which allows noise signal to pass to the Snare Voicing circuit Q104 and Q105 where it is voiced for proper tonality. The voiced noise signal at the output of Q105 combines with the High and Low Drum signals, together creating the Snare Drum voice.

Q100, Q102, Q103 BRUSH KEYER, BRUSH VOICING

Positive pulses from Pin 22 of IC30 are applied to the base of Q102, Brush Keyer, turning it on. This applies positive voltage to Diode D151 which now conducts allowing noise signal to pass to the Brush Voicing circuit. Here the signal is voiced for proper Brush tonality then applied to the Rhythm Preamp IC41D. With each positive pulse applied to Q102, a .22 uf capacitor is charged. The length of the Brush tone is regulated by varying the discharge time of this capacitor. Depending on the position of the Rhythm Select switch, pressing a Rhythm tab connects a resistor to ground from the on contact of the Rhythm switch to the Brush Keying line at IC30 Pin 22. The value of this resistor regulates the discharge rate of the .22 uf capacitor, thereby regulating the length of the Brush tone.

Q97, Q98, Q99 CYMBAL KEYER, CYMBAL VOICING

Positive pulses from Pin 21 of IC30 are applied to the base of Q97, Cymbal Keyer, turning it on. This applies positive voltage to Diode D149 which now conducts allowing noise signal to pass to the Cymbal Voicing circuit. Here the signal is voiced for proper Cymbal tonality then applied to the Rhythm Preamp IC41D. With each positive pulse applied to Q97, a .27 uf capacitor is charged. The length of the Cymbal tone is regulated by varying the discharge time of this capacitor. Depending on the position of the Rhythm Select switch, pressing a Rhythm tab connects a resistor to ground from the on contact of the Rhythm switch to the Cymbal Keying line at IC30 Pin 21. The value of this resistor regulates the discharge rate of the .27 uf capacitor, thereby regulating the length of the Cymbal tone.

IC32D INVERTER

With the rhythm tabs off, the input to IC32D is low. This applies a high output to the Rhythm Start tab (see Schematic 8) and to the Accompaniment Modulator Driver Q90. The low input to IC32D is routed to the Rhythm On Detector IC44A (see Schematic 8). Turning on any rhythm tab routes positive voltage to the Rhythm On Detector. The low output of IC32D is applied to the Rhythm Start tab and to Diode D116. This enables Accompaniment trigger pulses from IC30 Pin 23 to be applied to the base of Q90.

Q90 ACCOMPANIMENT MODULATOR DRIVER

Positive voltage pulses from Pin 23 of IC30 are applied to the base of Accompaniment Modulator Driver Q90, causing it to turn on. When Q90 turns on, it applies a positive voltage pulse to IC16 Pin 5 (via the Genie Voices Tab) gating the Accompaniment Keyboard signal through IC16 in a pattern determined by the rhythm selected. Pin 24 of IC30 is normally low. In this condition the Accompaniment Keyboard audio has a staccato sound. For certain rhythm time points, Pin 24 goes positive, removing the discharge path for the .22 uf capacitor at the base of Q90. This gives a sustain to the modulated audio. If no rhythm tabs are pressed, a steady positive voltage is applied from Inverter IC32D through D116 to the base of Q90. This holds IC16 on and allows the Accompaniment Keyboard signal to pass unmodulated.

IC41D, Q86 RHYTHM PREAMP, OUTPUT PREAMP

Audio signals created by the Instrumentation circuits are applied to the Rhythm Preamp IC41D where the signal is amplified before being applied to the Rhythm Volume Control. The Rhythm Output Preamp amplifies the instrumentation audio and applies it to the Main and Leslie Mixing Preamps.

IC32C STRUM SPEED REGULATOR

Clock Multivibrator pulses are inverted by IC32C and applied to the Chord Function Generator via the Slow Pick tab. Each pulse applied to the CFG will advance an internal shift register which will apply voltage to a strum keying line.

CIRCUIT DESCRIPTION

SCHEMATIC 10

MAIN & LESLIE AMPLIFIERS

Q110-Q116 MAIN & LESLIE AMPLIFIERS

The Main and Leslie Amplifiers are identical. They are direct coupled with a quasi-complimentary output configuration. The power output is rated at 25 watts RMS for each amplifier. The function of the preamp is to boost the signal voltages to a point where they can be used by the driver and pre-driver circuits. The Differential Preamp senses the signal at the output of the amplifier and controls it by regulating the signal input at the preamp. The pre-driver inverts the audio voltages so that the drivers work in push-pull. The output transistors convert the audio voltages from the drivers into high-current, low-voltage output signal that is connected via the headphone jack to the speakers.

SCHEMATIC 11

POWER SUPPLY

AC line source voltage is converted into positive and negative DC supply voltages using Transformer T1 and Rectifier Bridge D170. Zener Diodes Z1-Z5, Regulator Transistors Q120 & Q121 and Regulator IC50 are used as voltage regulators on several voltage lines. Some of the voltage divider circuits are located on various boards throughout the organ. These circuits are shown enclosed in dotted lines with a note for their location. A 2-amp, Slo-Blo fuse is employed in the primary circuit of the power supply to prevent component damage in the event of a short circuit.

ADJUSTMENTS

VR1 VIBRATO SPEED ADJUSTMENT

Proper speed of the Vibrato Oscillator is between 6 and 7 Hz. The Vibrato Oscillator will not oscillate if adjustment is extreme.

VR2 HARMONICA ADJUSTMENT

This adjustment should be made for the best Harmonica effect. Too extreme an adjustment will cause a shallow Wow effect or loss of the Vibrato effect.

L2 TUNING COIL

This adjustment is carefully set at the factory. Should tuning be necessary, it is suggested a tuning fork for a certain note be used (C for example). By holding down a key (C for example), adjust the tuning coil with a non-metalic screwdriver until no roll or beat is heard between the organ note and fork tone. When this note is properly tuned, the TOS tuning is automatically locked in.

VR4 PERCUSSION THUMP ADJUSTMENT

The Percussion length is factory-set by component values. The purpose of the Percussion Thump Adjustment is to eliminate any DC transient (thump) that may occur when playing the Banjo, Harmonic Flute or Mandolin voices. To adjust, set expression shoe on maximum. Turn on either the Mandolin, Harmonic Flute or Banjo tabs. Turn adjustment until minimum thump is heard. If thump cannot be reduced satisfactorily by adjustment, then replace Modulator IC.

VR10 BIAS ADJUSTMENT

This potentiometer adjusts the DC offset voltage for the Bucket Brigade IC20. With the Chorus Switch on and a key held down, turn VR10 in both directions until distortion occurs. Proper setting is the midpoint between the distortion regions.

VR11 CHORUS SPEED ADJUSTMENT

This adjustment regulates the frequency of the Chorus Speed Oscillator. The factory setting is 2 Hz - too extreme an adjustment will result in loss of the chorus effect.

VR7 ACCOMPANIMENT THUMP ADJUSTMENT

The Accompaniment length is factory-set by component values. The purpose of the Accompaniment Thump Adjustment is to eliminate any DC transient (thump) that may occur when playing the Accompaniment voices. To adjust, turn on any rhythm and an accompaniment tabswitch (Piano, Guitar, Banjo), set rhythm volume at minimum and expression shoe at maximum. Turn adjustment until minimum thump is heard. If thump level cannot be reduced satisfactorily by adjustment, then replace Accompaniment Modulator IC.

L15 CHORD TUNING COIL

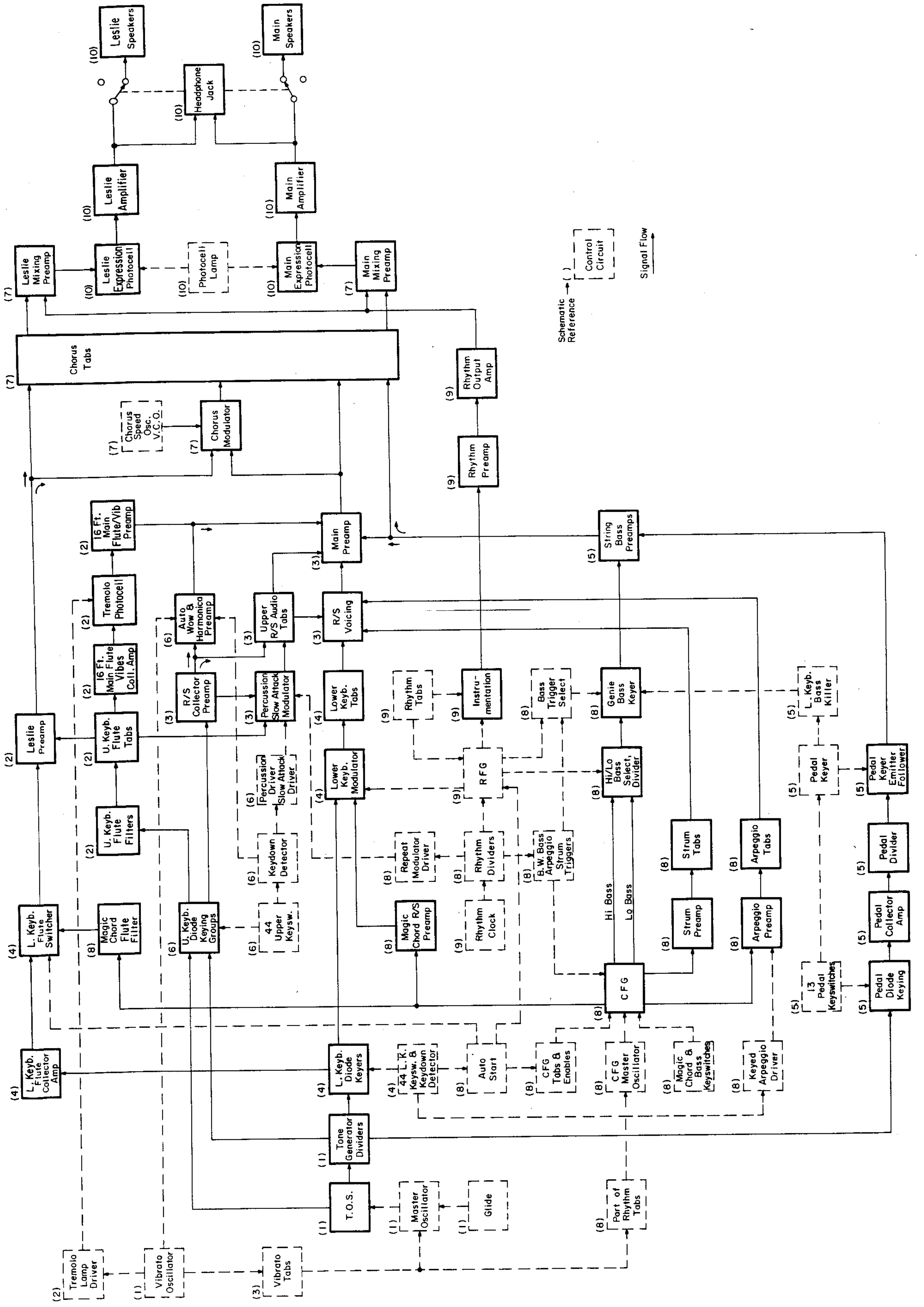
First, tune L2 as described above. Then turn off the Magic Chord tab and all Rhythm tabs. Turn on only the lower Keyboard String Bass voice and Upper Keyboard Horn voice. Now, holding a C on both the Upper and Lower Keyboards, adjust Tuning Coil L15 until no roll or beat is heard between the two notes.

NOTE: When tuning, always make sure all vibrato and vibrato pre-set voices are off.

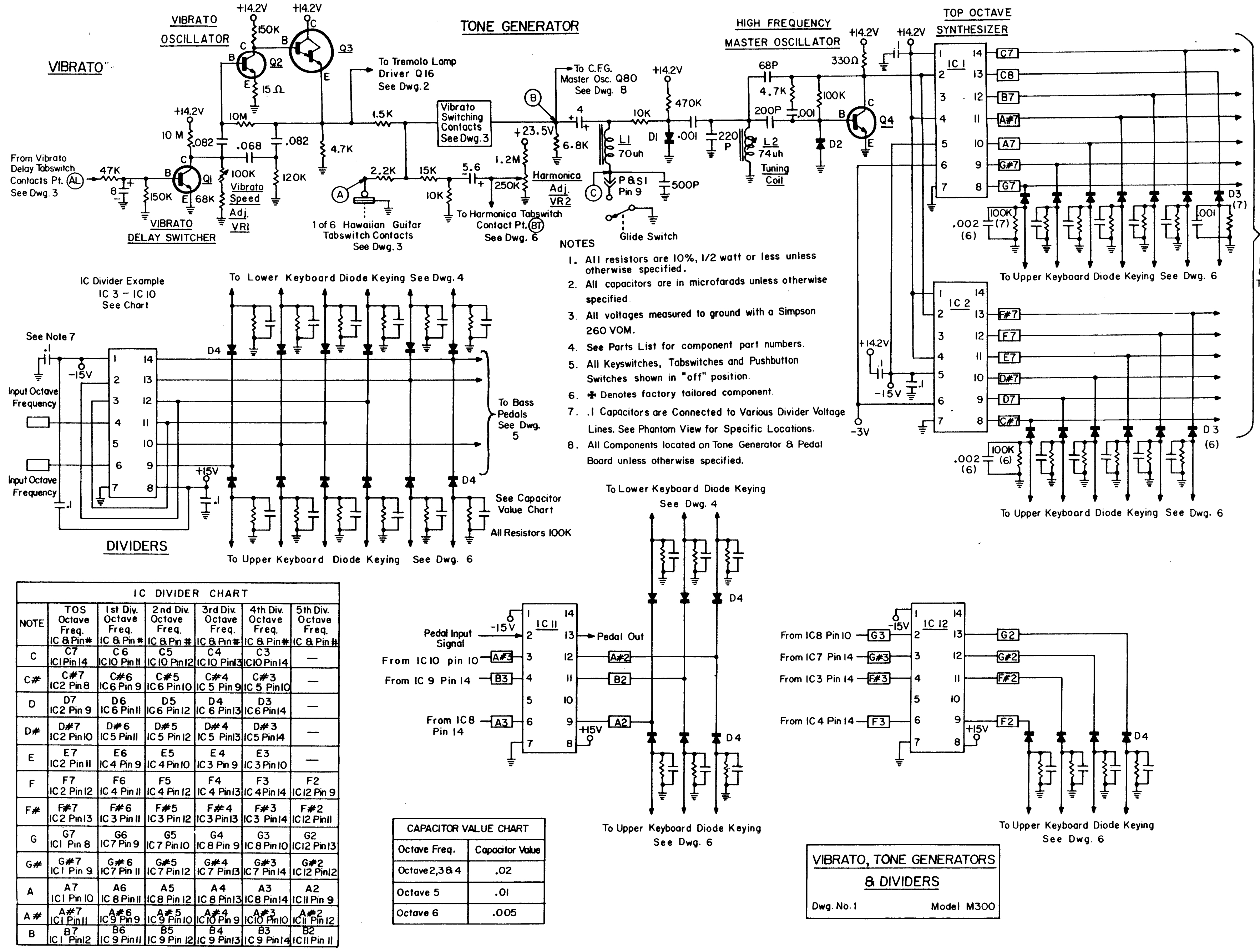
VR13 CHORD LEVEL ADJUSTMENT

With the Magic Chord tab off, hold a 3-note left-hand chord; switch the Magic Chord tab on and hold the same chord, but as a Genie one-note chord. Adjust VR13 until the volume level of the chord is the same with the Magic Chord tab on or off.

BLOCK DIAGRAM


(10) Leslie Speakers
(10) Main Speakers
(10) Headphone Jack
(10) Leslie Amplifier
(10) Main Amplifier
(7) Leslie Mixing Preamp
(10) Leslie Expression Photocell
(10) Photocell Lamp
(10) Main Expression Photocell
(7) Main Mixing Preamp
(7) Chorus Tabs
(9) Rhythm Output Amp
(7) Chorus Speed Osc. V.C.O.
(7) Chorus Modulator
(9) Rhythm Preamp
Control Circuit
Schematic Reference
Signal Flow
(2) 16 Ft. Main Flute/Vib Preamp
(3) Main Preamp
(5) String Bass Preamps
(2) Tremolo Photocell
(6) Auto Wow & Harmonica Preamp
(3) Upper R/S Audio Tabs
(3) R/S Voicing
(2) 16 Ft. Main Flute Vibes Coll. Amp
(3) R/S Collector Preamp
(3) Percussion Slow Attack Modulator
(4) Lower Keyb. Tabs
(9) Rhythm Tabs
(9) Instrumentation
(8) Bass Trigger Select
(8) Genie Bass Keyer
(5) L. Keyb. Bass Killer
(2) Leslie Preamp
(2) U. Keyb. Flute Tabs
(6) Percussion Driver Slow Attack Driver
(4) Lower Keyb. Modulator
(9) R F G
(8) Hi/Lo Bass Select, Divider
(5) Pedal Keyer
(5) Pedal Keyer Emitter Follower
(2) U. Keyb. Flute Filters
(6) Keydown Detector
(8) Repeat Modulator Driver
(8) Rhythm Dividers
(8) B.W. Bass Arpeggio Strum Triggers
(8) Strum Tabs
(8) Arpeggio Tabs
(5) Pedal Divider
Hi Bass
Lo Bass
(4) L. Keyb. Flute Switcher
(8) Magic Chord Flute Filter
(6) U. Keyb. Diode Keying Groups
(6) 44 Upper Keysw.
(8) Magic Chord R/S Preamp
(9) Rhythm Clock
(8) Strum Preamp
(8) Arpeggio Preamp
(5) Pedal Collector Amp
(8) C F G
(5) 13 Pedal Keyswitches
(5) Pedal Diode Keying
(4) L. Keyb. Flute Collector Amp
(4) L. Keyb. Diode Keyers
(4) 44 L.K. Keysw. & Keydown Detector
(8) Auto Start
(8) CFG Tabs & Enables
(8) CFG Master Oscillator
(8) Magic Chord & Bass Keyswitches
(8) Keyed Arpeggio Driver
(1) Tone Generator Dividers
(1) T.O.S.
(1) Master Oscillator
(1) Glide
(8) Part of Rhythm Tabs
(2) Tremolo Lamp Driver
(1) Vibrato Oscillator
(3) Vibrato Tabs

SCHEMATIC 1


VIBRATO
VIBRATO OSCILLATOR
VIBRATO DELAY SWITCHER
TONE GENERATOR
HIGH FREQUENCY MASTER OSCILLATOR
TOP OCTAVE SYNTHESIZER
DIVIDERS
+14.2V
150K
15Ω
Q1
Q2
Q3
Q4
10M
10 M
.082
.068
.082
4.7K
120K
100K
Vibrato Speed Adj. VR1
68K
150K
47K
8
From Vibrato Delay Tabswitch Contacts Pt. (AL) See Dwg. 3
To Tremolo Lamp Driver Q16 See Dwg. 2
1.5K
Vibrato Switching Contacts See Dwg. 3
2.2K
15K
10K
5.6
(A)
1 of 6 Hawaiian Guitar Tabswitch Contacts See Dwg. 3
+23.5V
1.2M
250K
Harmonica Adj. VR2
To Harmonica Tabswitch Contact Pt. (BT) See Dwg. 6
(B)
To C.F.G. Master Osc. Q80 See Dwg. 8
4
6.8K
L1 70uh
D1
.001
470K
(C)
P&S1 Pin 9
500P
Glide Switch
68P
4.7K
200P
.001
220 P
L2 74uh
Tuning Coil
330Ω
D2
IC 1
C7
C8
B7
A#7
A7
G#7
G7
D3 (7)
.002 (6)
100K (7)
.001
To IC Dividers IC3-IC10 See Example & Chart This Dwg.
To Upper Keyboard Diode Keying See Dwg. 6
IC 2
F#7
F7
E7
D#7
D7
C#7
D3 (6)
100K (6)
.002 (6)
-15V
-3V
IC Divider Example IC 3 – IC 10 See Chart
See Note 7
Input Octave Frequency
+15V
D4
To Lower Keyboard Diode Keying See Dwg. 4
To Bass Pedals See Dwg. 5
See Capacitor Value Chart
All Resistors 100K
IC 11
Pedal Input Signal
From IC 10 pin 10
From IC 9 Pin 14
From IC 8 Pin 14
A#3
B3
A3
Pedal Out
A#2
B2
A2
IC 12
From IC8 Pin 10
From IC7 Pin 14
From IC3 Pin 14
From IC 4 Pin 14
G3
G#3
F#3
F3
G2
G#2
F#2
F2

NOTES

1. All resistors are 10%, 1/2 watt or less unless otherwise specified.
2. All capacitors are in microfarads unless otherwise specified.
3. All voltages measured to ground with a Simpson 260 VOM.
4. See Parts List for component part numbers.
5. All Keyswitches, Tabswitches and Pushbutton Switches shown in "off" position.
6. ✚ Denotes factory tailored component.
7. .1 Capacitors are Connected to Various Divider Voltage Lines. See Phantom View for Specific Locations.
8. All Components located on Tone Generator & Pedal Board unless otherwise specified.

IC DIVIDER CHART

NOTE	TOS Octave Freq. IC & Pin #	1st Div. Octave Freq. IC & Pin #	2nd Div. Octave Freq. IC & Pin #	3rd Div. Octave Freq. IC & Pin #	4th Div. Octave Freq. IC & Pin #	5th Div. Octave Freq. IC & Pin #
C	C7 IC1 Pin 14	C6 IC10 Pin 11	C5 IC10 Pin 12	C4 IC10 Pin13	C3 IC10 Pin 14	—
C#	C#7 IC2 Pin 8	C#6 IC6 Pin 9	C#5 IC6 Pin 10	C#4 IC 5 Pin 9	C#3 IC 5 Pin 10	—
D	D7 IC2 Pin 9	D6 IC 6 Pin 11	D5 IC6 Pin 12	D4 IC 6 Pin13	D3 IC6 Pin 14	—
D#	D#7 IC2 Pin 10	D#6 IC5 Pin 11	D#5 IC 5 Pin 12	D#4 IC 5 Pin13	D#3 IC5 Pin 14	—
E	E7 IC2 Pin 11	E6 IC 4 Pin 9	E5 IC 4 Pin 10	E4 IC 3 Pin 9	E3 IC 3 Pin 10	—
F	F7 IC 2 Pin 12	F6 IC 4 Pin 11	F5 IC 4 Pin 12	F4 IC 4 Pin13	F3 IC 4 Pin 14	F2 IC 12 Pin 9
F#	F#7 IC 2 Pin 13	F#6 IC 3 Pin 11	F#5 IC 3 Pin 12	F#4 IC 3 Pin 13	F#3 IC 3 Pin 14	F#2 IC 12 Pin 11
G	G7 IC1 Pin 8	G6 IC7 Pin 9	G5 IC 7 Pin 10	G4 IC 8 Pin 9	G3 IC 8 Pin 10	G2 IC12 Pin 13
G#	G#7 IC1 Pin 9	G#6 IC7 Pin 11	G#5 IC 7 Pin 12	G#4 IC 7 Pin13	G#3 IC 7 Pin 14	G#2 IC 12 Pin 12
A	A7 IC1 Pin 10	A6 IC 8 Pin 11	A5 IC8 Pin 12	A4 IC 8 Pin13	A3 IC8 Pin 14	A2 IC 11 Pin 9
A#	A#7 IC1 Pin 11	A#6 IC9 Pin 9	A#5 IC 9 Pin 10	A#4 IC10 Pin 9	A#3 IC10 Pin 10	A#2 IC11 Pin 12
B	B7 IC1 Pin 12	B6 IC 9 Pin 11	B5 IC 9 Pin 12	B4 IC 9 Pin13	B3 IC 9 Pin 14	B2 IC 11 Pin 11

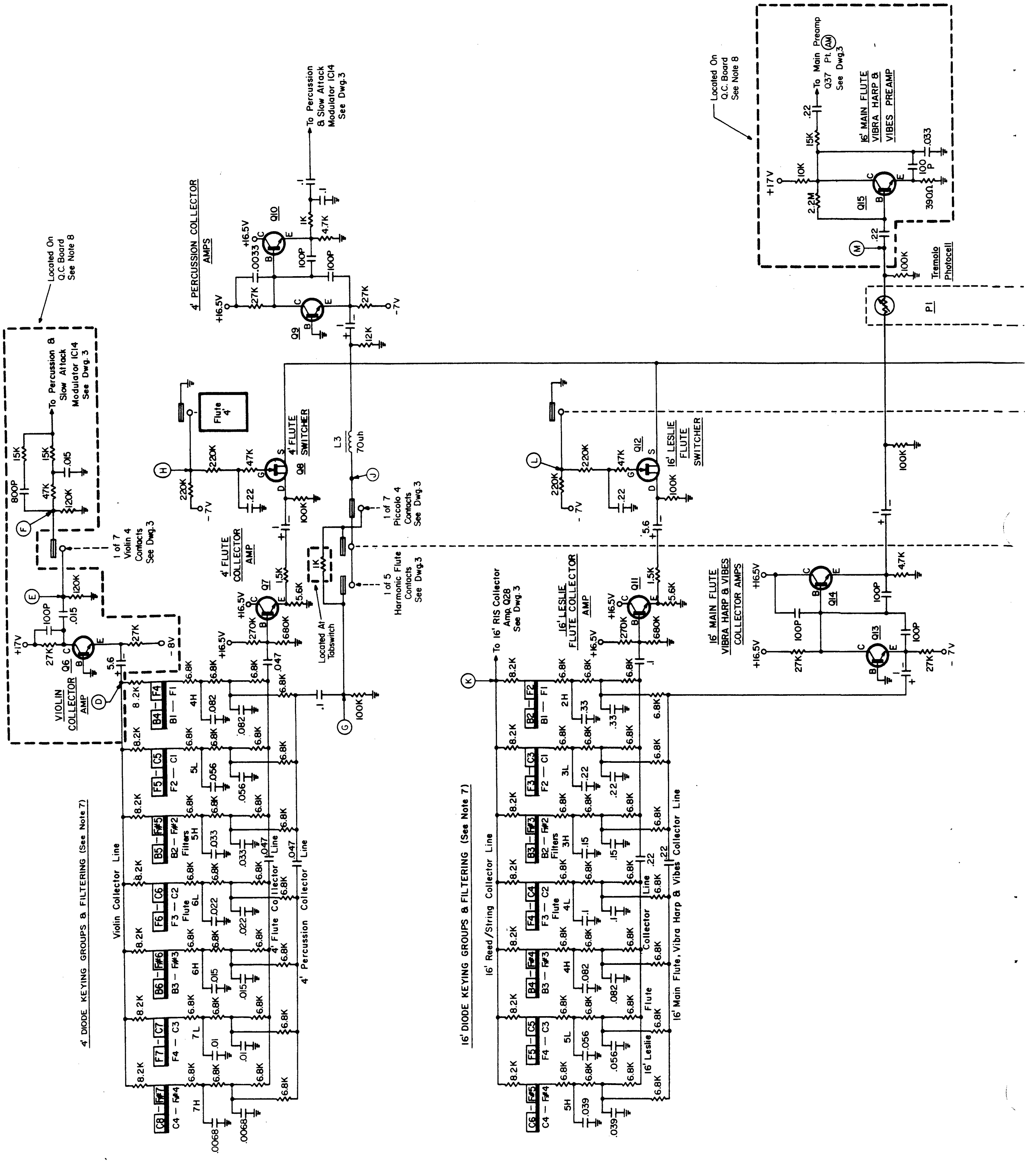
CAPACITOR VALUE CHART

Octave Freq.	Capacitor Value
Octave 2,3 & 4	.02
Octave 5	.01
Octave 6	.005

VIBRATO, TONE GENERATORS & DIVIDERS

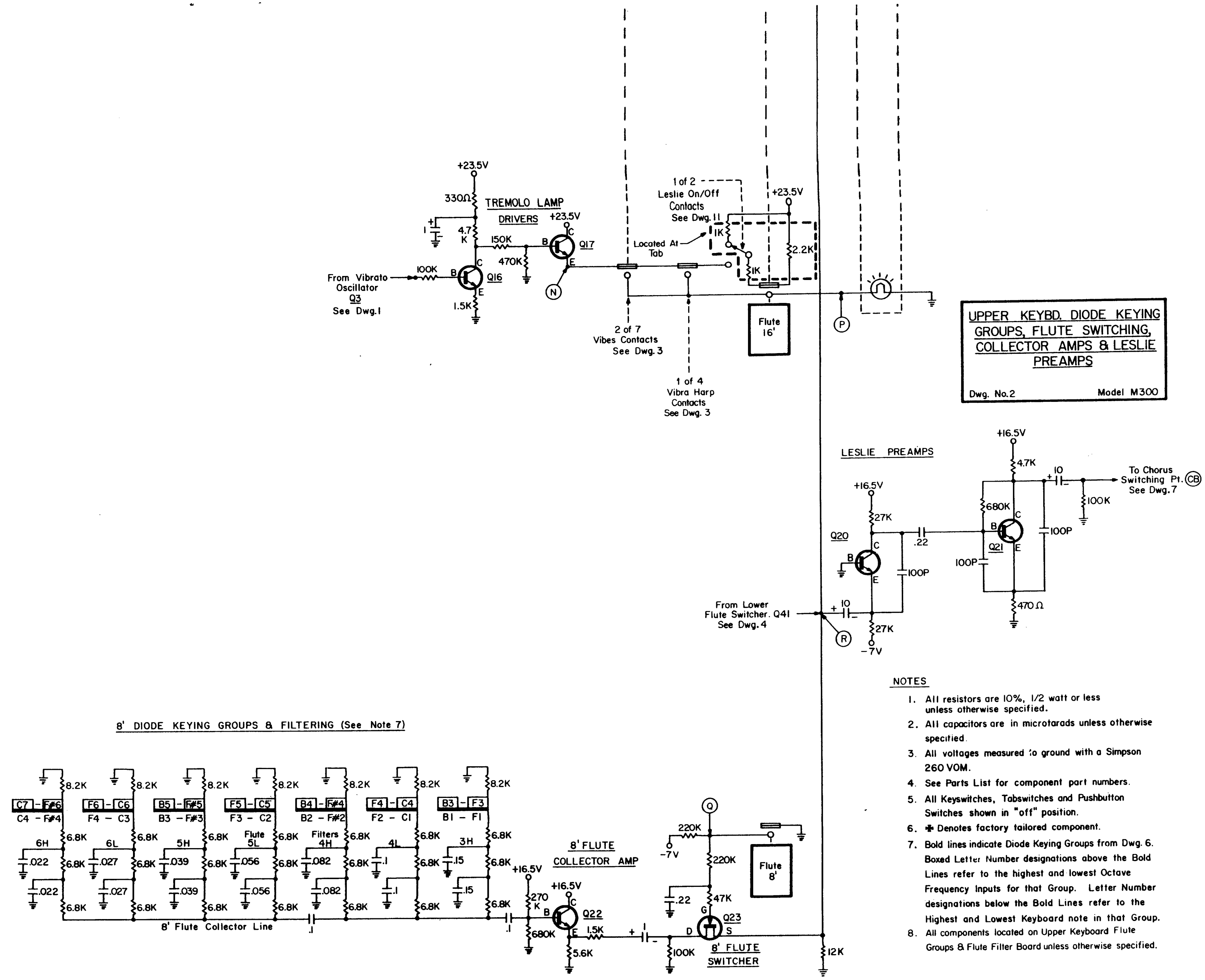
Dwg. No. 1 Model M300

SCHEMATIC 2



4' DIODE KEYING GROUPS & FILTERING (See Note 7)
16' DIODE KEYING GROUPS & FILTERING (See Note 7)
Violin Collector Line
4' Flute Collector Line
4' Percussion Collector Line
16' Reed/String Collector Line
16' Leslie Flute Collector Line
16' Main Flute, Vibra Harp & Vibes Collector Line
VIOLIN COLLECTOR AMP
Q6
4' FLUTE COLLECTOR AMP
Q7
4' FLUTE SWITCHER
Q8
4' PERCUSSION COLLECTOR AMPS
Q9
Q10
16' LESLIE FLUTE COLLECTOR AMP
Q11
16' LESLIE FLUTE SWITCHER
Q12
16' MAIN FLUTE VIBRA HARP & VIBES COLLECTOR AMPS
Q13
Q14
16' MAIN FLUTE VIBRA HARP & VIBES PREAMP
Q15
Located On Q.C. Board See Note 8
To Percussion & Slow Attack Modulator IC14 See Dwg. 3
To Percussion & Slow Attack Modulator IC14 See Dwg.3
To Main Preamp Q37 Pt. AM See Dwg.3
To 16' RIS Collector Amp Q28 See Dwg.3
1 of 7 Violin 4 Contacts See Dwg.3
1 of 7 Piccolo 4 Contacts See Dwg.3
1 of 5 Harmonic Flute Contacts See Dwg.3
Located At Tabswitch
Flute 4'
Tremolo Photocell
P1
L3
70uh
C8-F#7
F7-C7
B6-F#6
F6-C6
B5-F#5
F5-C5
B4-F4
C4-F#4
F4-C3
B3-F#3
F3-C2
B2-F#2
F2-C1
B1-F1
C6-F#5
F5-C5
B4-F4
F4-C4
B3-F#3
F3-C3
B2-F2
Filters
Flute
7H
7L
6H
6L
5H
5L
4H
3H
3L
2H
4L
+17V
+16.5V
-7V
-8V
D
E
F
G
H
J
K
L
M
8.2K
6.8K
27K
15K
47K
120K
800P
.015
100P
5.6
270K
680K
1.5K
5.6K
220K
.22
100K
12K
.0033
1K
4.7K
.1
2.2M
10K
390Ω
.033
.0068
.01
.015
.022
.033
.047
.056
.082
.039
.15
.33

SCHEMATIC 2


+23.5V
330Ω
TREMOLO LAMP DRIVERS
+23.5V
4.7 K
150K
470K
Q17
100K
Q16
1.5K
From Vibrato Oscillator Q3 See Dwg.1
N
1 of 2 Leslie On/Off Contacts See Dwg. 11
Located At Tab
1K
1K
2.2K
+23.5V
2 of 7 Vibes Contacts See Dwg. 3
1 of 4 Vibra Harp Contacts See Dwg. 3
Flute 16'
P
LESLIE PREAMPS
+16.5V
4.7K
10
To Chorus Switching Pt. CB See Dwg.7
100K
680K
100P
Q21
100P
470Ω
+16.5V
27K
Q20
.22
100P
From Lower Flute Switcher. Q41 See Dwg.4
10
R
27K
-7V
8' DIODE KEYING GROUPS & FILTERING (See Note 7)
8.2K
C7 - F#6
C4 - F#4
F6 - C6
F4 - C3
B5 - F#5
B3 - F#3
F5 - C5
F3 - C2
B4 - F#4
B2 - F#2
F4 - C4
F2 - C1
B3 - F3
B1 - F1
6H
6L
5H
Flute 5L
Filters 4H
4L
3H
6.8K
.022
.027
.039
.056
.082
.1
.15
8' Flute Collector Line
.1
+16.5V
270 K
+16.5V
Q22
680K
1.5K
5.6K
8' FLUTE COLLECTOR AMP
Q
220K
-7V
220K
.22
47K
Q23
100K
8' FLUTE SWITCHER
Flute 8'
12K

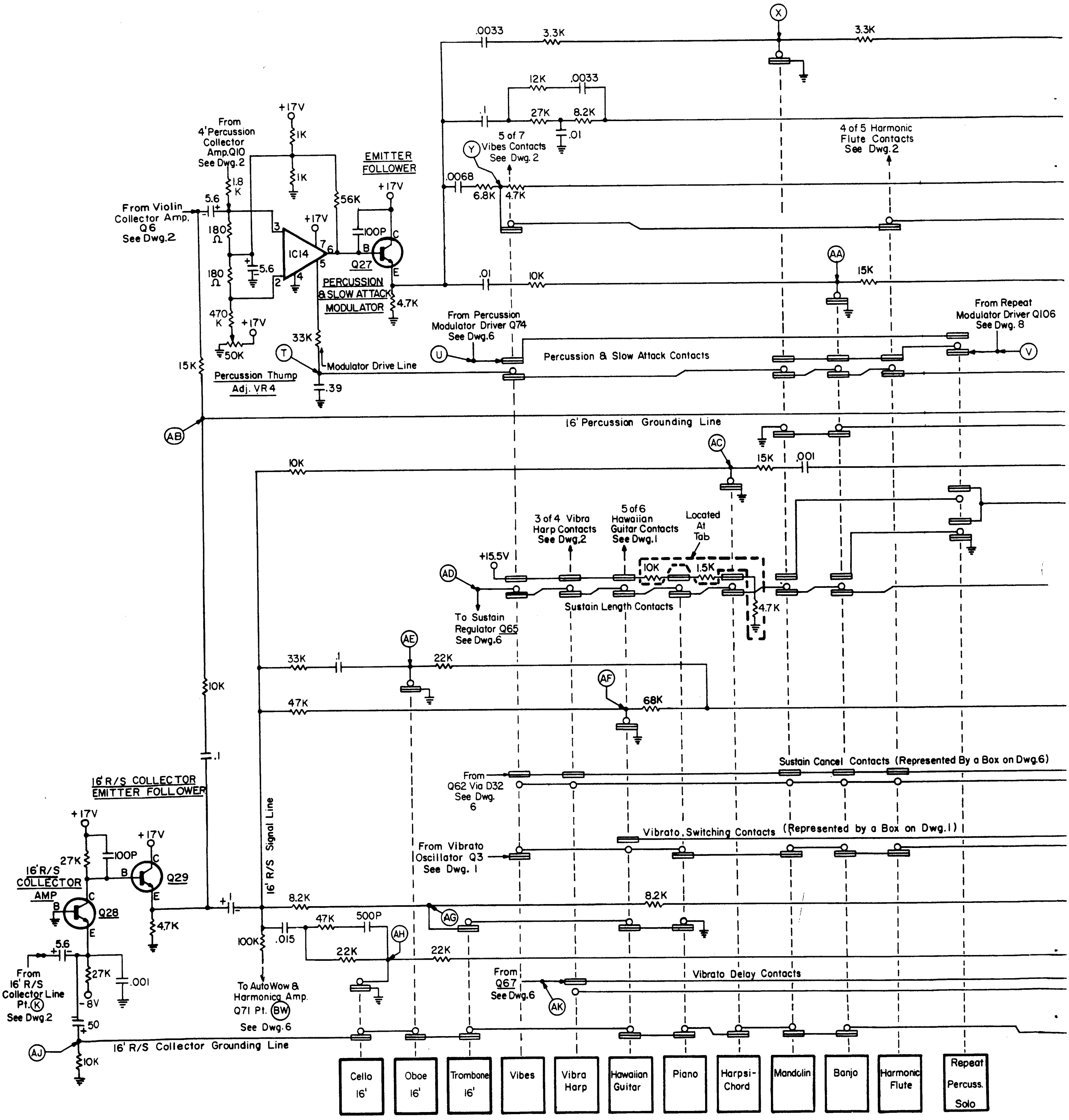
UPPER KEYBD. DIODE KEYING GROUPS, FLUTE SWITCHING, COLLECTOR AMPS & LESLIE PREAMPS

Dwg. No.2 Model M300

NOTES

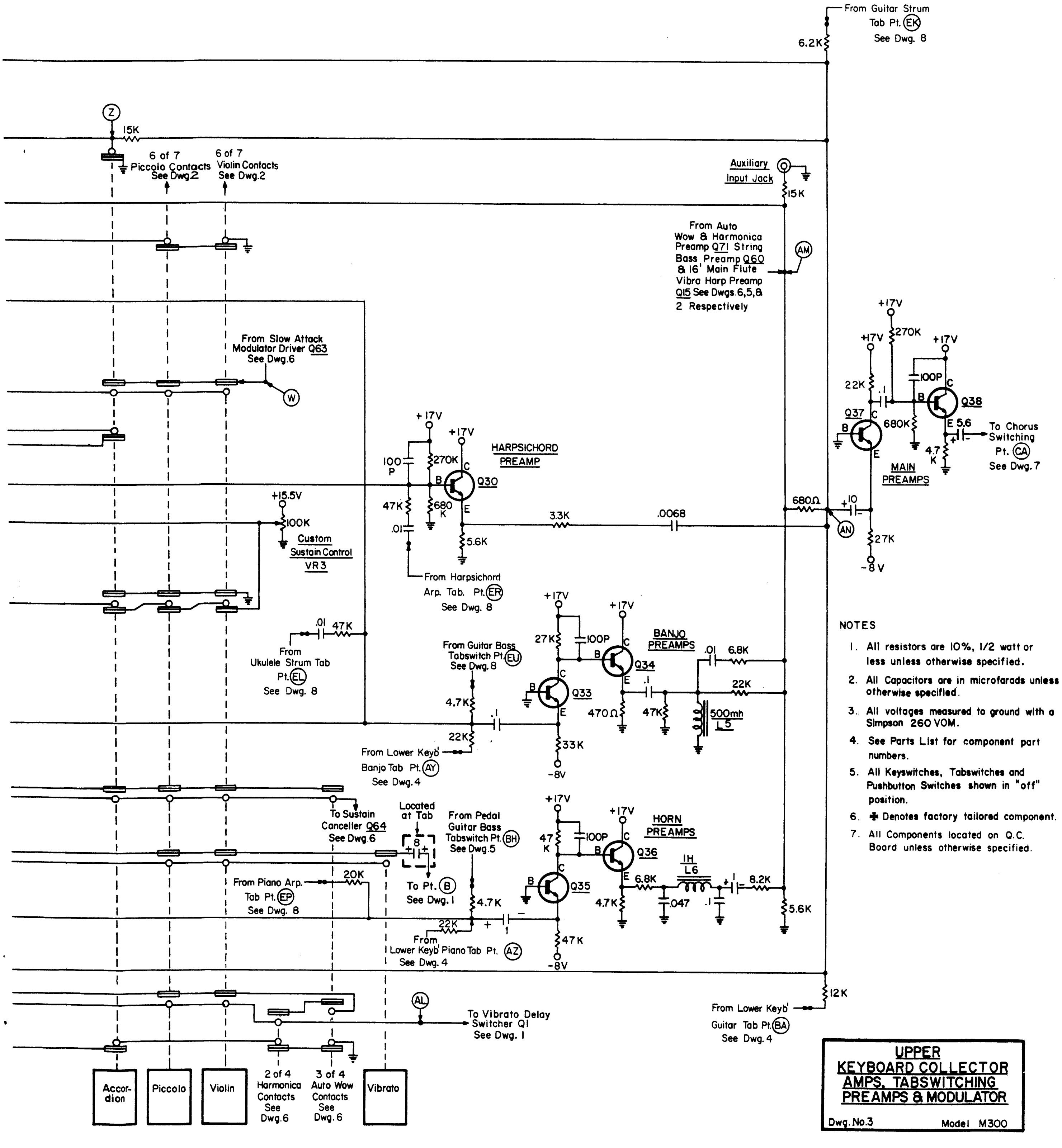
1. All resistors are 10%, 1/2 watt or less unless otherwise specified.
2. All capacitors are in microfarads unless otherwise specified.
3. All voltages measured to ground with a Simpson 260 VOM.
4. See Parts List for component part numbers.
5. All Keyswitches, Tabswitches and Pushbutton Switches shown in "off" position.
6. ✱ Denotes factory tailored component.
7. Bold lines indicate Diode Keying Groups from Dwg. 6. Boxed Letter Number designations above the Bold Lines refer to the highest and lowest Octave Frequency Inputs for that Group. Letter Number designations below the Bold Lines refer to the Highest and Lowest Keyboard note in that Group.
8. All components located on Upper Keyboard Flute Groups & Flute Filter Board unless otherwise specified.

SCHEMATIC 3



.0033
3.3K
X
3.3K
12K
.0033
.1
27K
8.2K
.01
4 of 5 Harmonic Flute Contacts See Dwg. 2
5 of 7 Vibes Contacts See Dwg. 2
Y
+17V
1K
1K
From 4'Percussion Collector Amp.Q10 See Dwg.2
EMITTER FOLLOWER
.0068
6.8K
4.7K
+17V
56K
1.8 K
5.6
From Violin Collector Amp. Q6 See Dwg.2
180 Ω
180 Ω
5.6
IC14
3
2
7
6
5
4
+17V
100P
Q27
B
C
E
PERCUSSION & SLOW ATTACK MODULATOR
4.7K
.01
10K
AA
15K
From Repeat Modulator Driver Q106 See Dwg. 8
470 K
+17V
50K
33K
T
Modulator Drive Line
.39
Percussion Thump Adj. VR4
From Percussion Modulator Driver Q74 See Dwg.6
U
Percussion & Slow Attack Contacts
V
15K
AB
16' Percussion Grounding Line
AC
10K
15K
.001
3 of 4 Vibra Harp Contacts See Dwg.2
5 of 6 Hawaiian Guitar Contacts See Dwg.1
Located At Tab
+15.5V
AD
10K
1.5K
4.7K
Sustain Length Contacts
To Sustain Regulator Q65 See Dwg.6
AE
33K
.1
22K
AF
47K
68K
10K
.1
Sustain Cancel Contacts (Represented By a Box on Dwg.6)
From Q62 Via D32 See Dwg. 6
16'R/S COLLECTOR EMITTER FOLLOWER
16' R/S Signal Line
Vibrato Switching Contacts (Represented by a Box on Dwg.1)
From Vibrato Oscillator Q3 See Dwg. 1
+17V
+17V
27K
100P
16'R/S COLLECTOR AMP
B
C
E
Q29
Q28
4.7K
1
8.2K
AG
8.2K
47K
500P
AH
100K
.015
22K
22K
5.6
27K
.001
-8V
From 16' R/S Collector Line Pt. K See Dwg.2
50
To AutoWow & Harmonica Amp. Q71 Pt. BW See Dwg. 6
From Q67 See Dwg.6
AK
Vibrato Delay Contacts
AJ
10K
16' R/S Collector Grounding Line
Cello 16'
Oboe 16'
Trombone 16'
Vibes
Vibra Harp
Hawaiian Guitar
Piano
Harpsi-Chord
Mandolin
Banjo
Harmonic Flute
Repeat Percuss. Solo

SCHEMATIC 3


From Guitar Strum Tab Pt. (EK) See Dwg. 8
6.2K
(Z)
15K
6 of 7 Piccolo Contacts See Dwg.2
6 of 7 Violin Contacts See Dwg.2
Auxiliary Input Jack
15K
From Auto Wow & Harmonica Preamp Q71 String Bass Preamp Q60 & 16' Main Flute Vibra Harp Preamp Q15 See Dwgs.6,5,& 2 Respectively
(AM)
From Slow Attack Modulator Driver Q63 See Dwg.6
(W)
+17V
270K
+17V
+17V
22K
.1
100P
Q38
Q37
680K
5.6
To Chorus Switching Pt. (CA) See Dwg. 7
4.7 K
MAIN PREAMPS
+17V
+17V
HARPSICHORD PREAMP
100 P
270K
Q30
47K
680 K
.01
5.6K
3.3K
.0068
680Ω
10
(AN)
27K
-8V
+15.5V
100K
Custom Sustain Control VR3
From Harpsichord Arp. Tab. Pt. (ER) See Dwg. 8
+17V
+17V
27K
100P
BANJO PREAMPS
Q34
.01
6.8K
.01
47K
From Ukulele Strum Tab Pt. (EL) See Dwg. 8
From Guitar Bass Tabswitch Pt. (EU) See Dwg. 8
Q33
.1
22K
4.7K
470Ω
47K
500mh L5
.1
22K
33K
-8V
From Lower Keyb' Banjo Tab Pt. (AY) See Dwg. 4
To Sustain Canceller Q64 See Dwg.6
Located at Tab
8
From Pedal Guitar Bass Tabswitch Pt. (BH) See Dwg.5
+17V
+17V
HORN PREAMPS
47 K
100P
Q36
Q35
6.8K
1H L6
.1
8.2K
4.7K
.047
.1
5.6K
20K
From Piano Arp. Tab Pt. (EP) See Dwg. 8
To Pt. (B) See Dwg. 1
4.7K
22K
1
From Lower Keyb' Piano Tab Pt. (AZ) See Dwg. 4
47K
-8V
12K
From Lower Keyb' Guitar Tab Pt. (BA) See Dwg. 4
(AL)
To Vibrato Delay Switcher Q1 See Dwg. 1
Accordion
Piccolo
Violin
2 of 4 Harmonica Contacts See Dwg.6
3 of 4 Auto Wow Contacts See Dwg.6
Vibrato

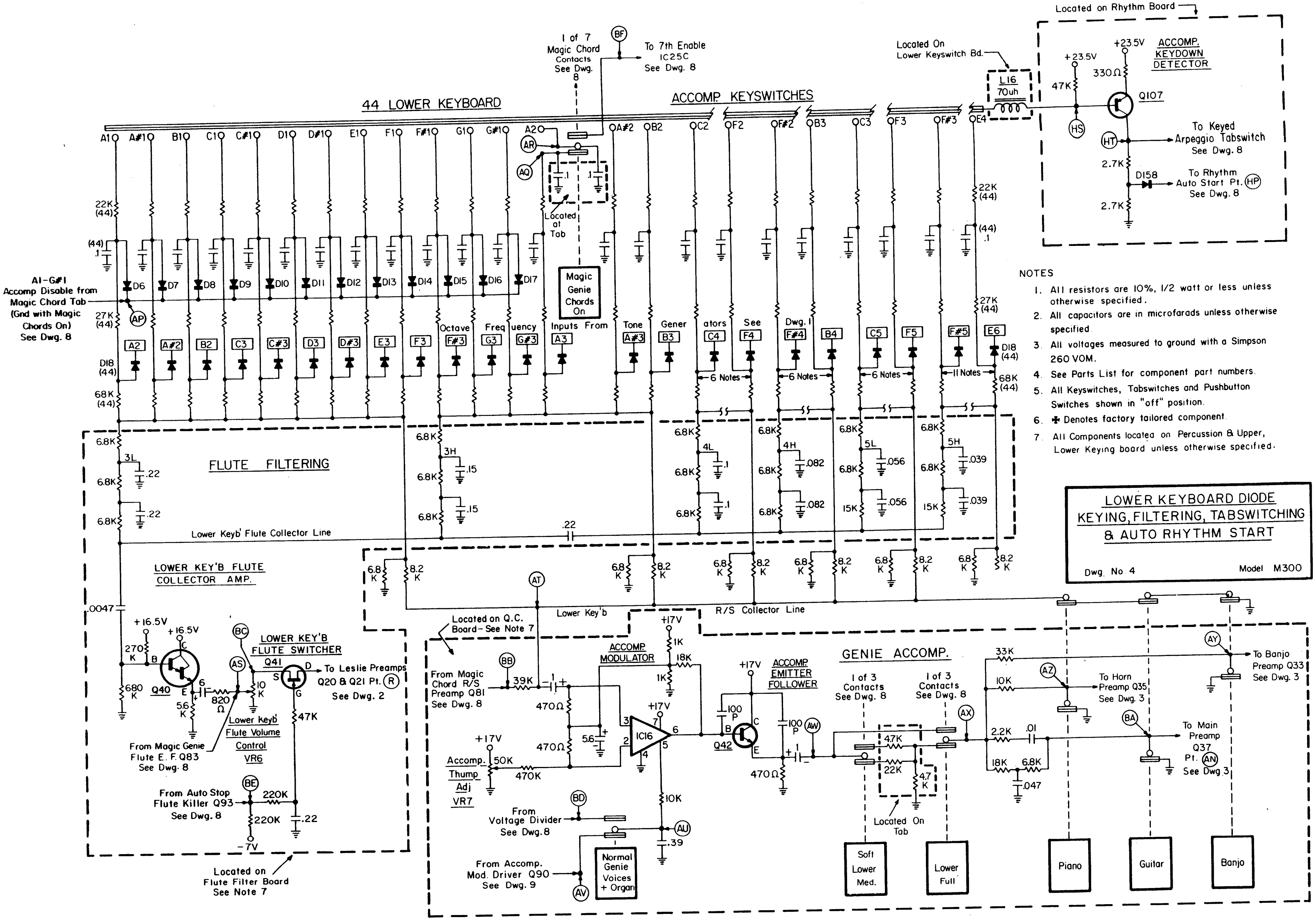
NOTES

1. All resistors are 10%, 1/2 watt or less unless otherwise specified.
2. All Capacitors are in microfarads unless otherwise specified.
3. All voltages measured to ground with a Simpson 260 VOM.
4. See Parts List for component part numbers.
5. All Keyswitches, Tabswitches and Pushbutton Switches shown in "off" position.
6. ✚ Denotes factory tailored component.
7. All Components located on Q.C. Board unless otherwise specified.

UPPER
KEYBOARD COLLECTOR
AMPS, TABSWITCHING
PREAMPS & MODULATOR

Dwg. No.3 Model M300

SCHEMATIC 4


44 LOWER KEYBOARD
ACCOMP KEYSWITCHES
A1 A#1 B1 C1 C#1 D1 D#1 E1 F1 F#1 G1 G#1 A2 A#2 B2 C2 F2 F#2 B3 C3 F3 F#3 E4
D6 D7 D8 D9 D10 D11 D12 D13 D14 D15 D16 D17
A2 A#2 B2 C3 C#3 D3 D#3 E3 F3 F#3 G3 G#3 A3 A#3 B3 C4 F4 F#4 B4 C5 F5 F#5 E6
Octave Frequency Inputs From Tone Generators See Dwg. 1
6 Notes
11 Notes
22K (44)
(44) .1
27K (44)
D18 (44)
68K (44)
Magic Genie Chords On
Located at Tab
1 of 7 Magic Chord Contacts See Dwg. 8
To 7th Enable IC25C See Dwg. 8
AI-G#I Accomp Disable from Magic Chord Tab (Gnd with Magic Chords On) See Dwg. 8
Located On Lower Keyswitch Bd.
L16 70uh
Located on Rhythm Board
+23.5V
47K
330Ω
ACCOMP. KEYDOWN DETECTOR
Q107
To Keyed Arpeggio Tabswitch See Dwg. 8
2.7K
D158
To Rhythm Auto Start Pt. HP See Dwg. 8
FLUTE FILTERING
6.8K
3L 3H 4L 4H 5L 5H
.22 .15 .1 .082 .056 .039
15K
Lower Keyb' Flute Collector Line
.22
8.2 K
6.8 K
R/S Collector Line
Lower Key'b
LOWER KEY'B FLUTE COLLECTOR AMP.
.0047
+16.5V
270 K
680
Q40
5.6 K
820 Ω
6
LOWER KEY'B FLUTE SWITCHER
Q41
To Leslie Preamps Q20 & Q21 Pt. R See Dwg. 2
10 K
47K
Lower Keyb' Flute Volume Control VR6
From Magic Genie Flute E. F. Q83 See Dwg. 8
From Auto Stop Flute Killer Q93 See Dwg. 8
220K
-7V
Located on Flute Filter Board See Note 7
Located on Q.C. Board - See Note 7
From Magic Chord R/S Preamp Q81 See Dwg. 8
39K
470Ω
+17V
1K
18K
ACCOMP MODULATOR
IC16
5.6
Accomp. Thump Adj VR7
50K
470K
10K
.39
From Voltage Divider See Dwg. 8
From Accomp. Mod. Driver Q90 See Dwg. 9
Normal Genie Voices + Organ
ACCOMP EMITTER FOLLOWER
100 P
Q42
GENIE ACCOMP.
1 of 3 Contacts See Dwg. 8
47K
22K
4.7 K
Located On Tab
Soft Lower Med.
Lower Full
33K
2.2K
.01
18K
6.8K
.047
To Banjo Preamp Q33 See Dwg. 3
To Horn Preamp Q35 See Dwg. 3
To Main Preamp Q37 Pt. AN See Dwg. 3
Piano
Guitar
Banjo
AP AQ AR AS AT AU AV AW AX AY AZ BA BB BC BD BE BF HS HT

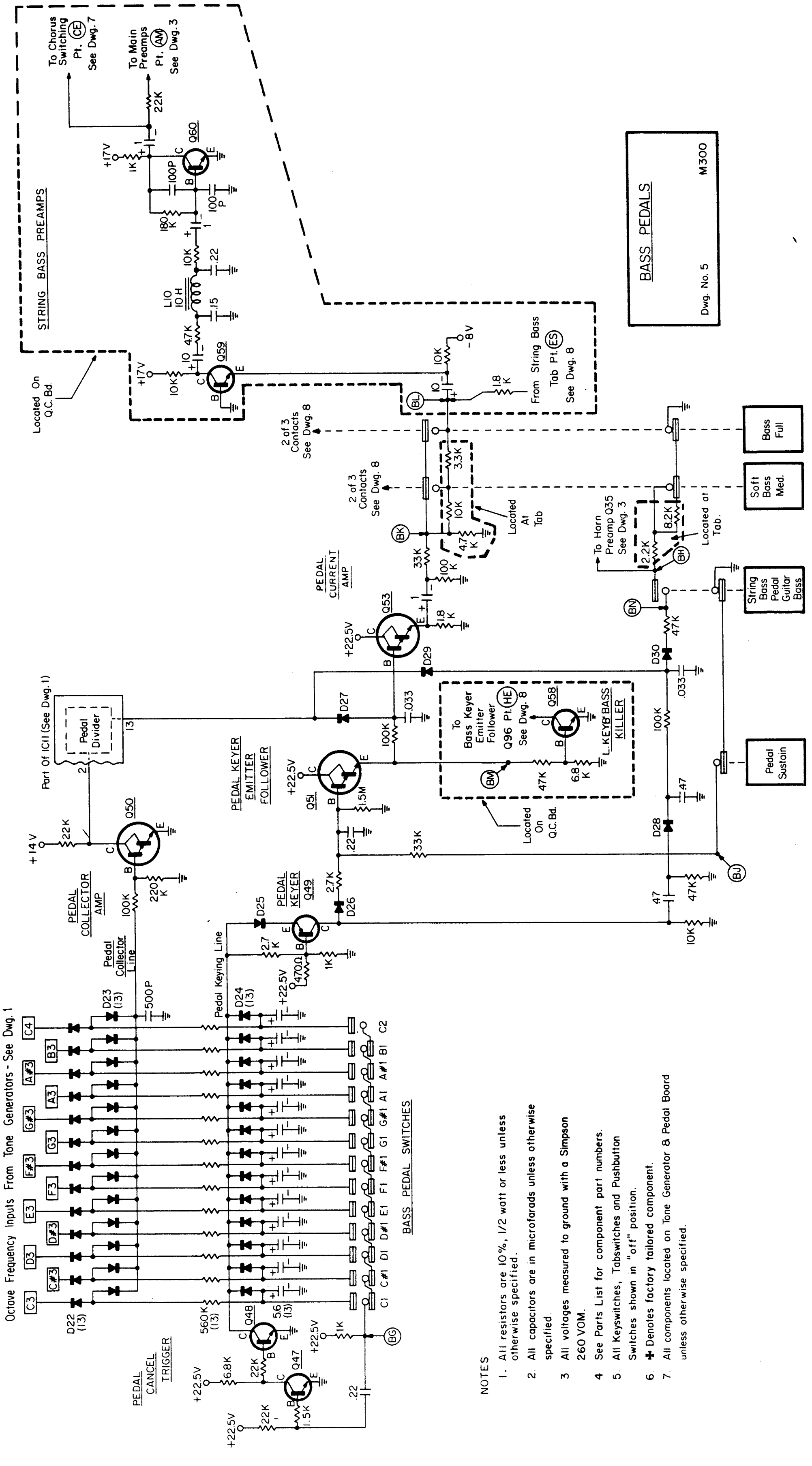
NOTES

1. All resistors are 10%, 1/2 watt or less unless otherwise specified.
2. All capacitors are in microfarads unless otherwise specified.
3. All voltages measured to ground with a Simpson 260 VOM.
4. See Parts List for component part numbers.
5. All Keyswitches, Tabswitches and Pushbutton Switches shown in "off" position.
6. ✚ Denotes factory tailored component.
7. All Components located on Percussion & Upper, Lower Keying board unless otherwise specified.

LOWER KEYBOARD DIODE
KEYING, FILTERING, TABSWITCHING
& AUTO RHYTHM START

Dwg. No 4
Model M300

SCHEMATIC 5


STRING BASS PREAMPS
To Chorus Switching Pt. (CE) See Dwg. 7
To Main Preamps Pt. (AM) See Dwg. 3
22K
+17V
1K
1
100P
Q60
180 K
10K
.22
L10 10H
.15
47K
10
100 P
+17V
10K
Q59
Located On Q.C. Bd.
10K
-8V
(BL)
10
1.8 K
From String Bass Tab Pt. (ES) See Dwg. 8
2 of 3 Contacts See Dwg. 8
2 of 3 Contacts See Dwg. 8
3.3K
10K
4.7 K
Located At Tab
(BK)
33K
100 K
PEDAL CURRENT AMP
Q53
+22.5V
1.8 K
D29
D27
.033
Part Of IC11 (See Dwg. 1)
Pedal Divider
13
2
+14V
22K
Q50
PEDAL COLLECTOR AMP
100K
220 K
Pedal Collector Line
D23 (13)
500P
PEDAL KEYER EMITTER FOLLOWER
+22.5V
Q51
1.5M
100K
To Bass Keyer Emitter Follower Q96 Pt. (HE) See Dwg. 8
Q58
L. KEYB'BASS KILLER
(BM)
47K
6.8 K
Located On Q.C. Bd.
.22
33K
PEDAL KEYER Q49
2.7K
D26
D25
2.7 K
470Ω
1K
+22.5V
Pedal Keying Line
D24 (13)
Bass Full
Soft Bass Med.
To Horn Preamp Q35 See Dwg. 3
2.2K
8.2K
(BH)
Located at Tab.
(BN)
47K
String Bass Pedal Guitar Bass
D30
.033
100K
Pedal Sustain
47
D28
(BJ)
47
47K
10K
Octave Frequency Inputs From Tone Generators - See Dwg. 1
C4
B3
A#3
A3
G#3
G3
F#3
F3
E3
D#3
D3
C#3
C3
D22 (13)
BASS PEDAL SWITCHES
C2
B1
A#1
A1
G#1
G1
F#1
F1
E1
D#1
D1
C#1
C1
560K (13)
Q48
5.6 (13)
+22.5V
1K
(BG)
PEDAL CANCEL TRIGGER
+22.5V
6.8K
22K
Q47
+22.5V
22K
1.5K
.22

NOTES

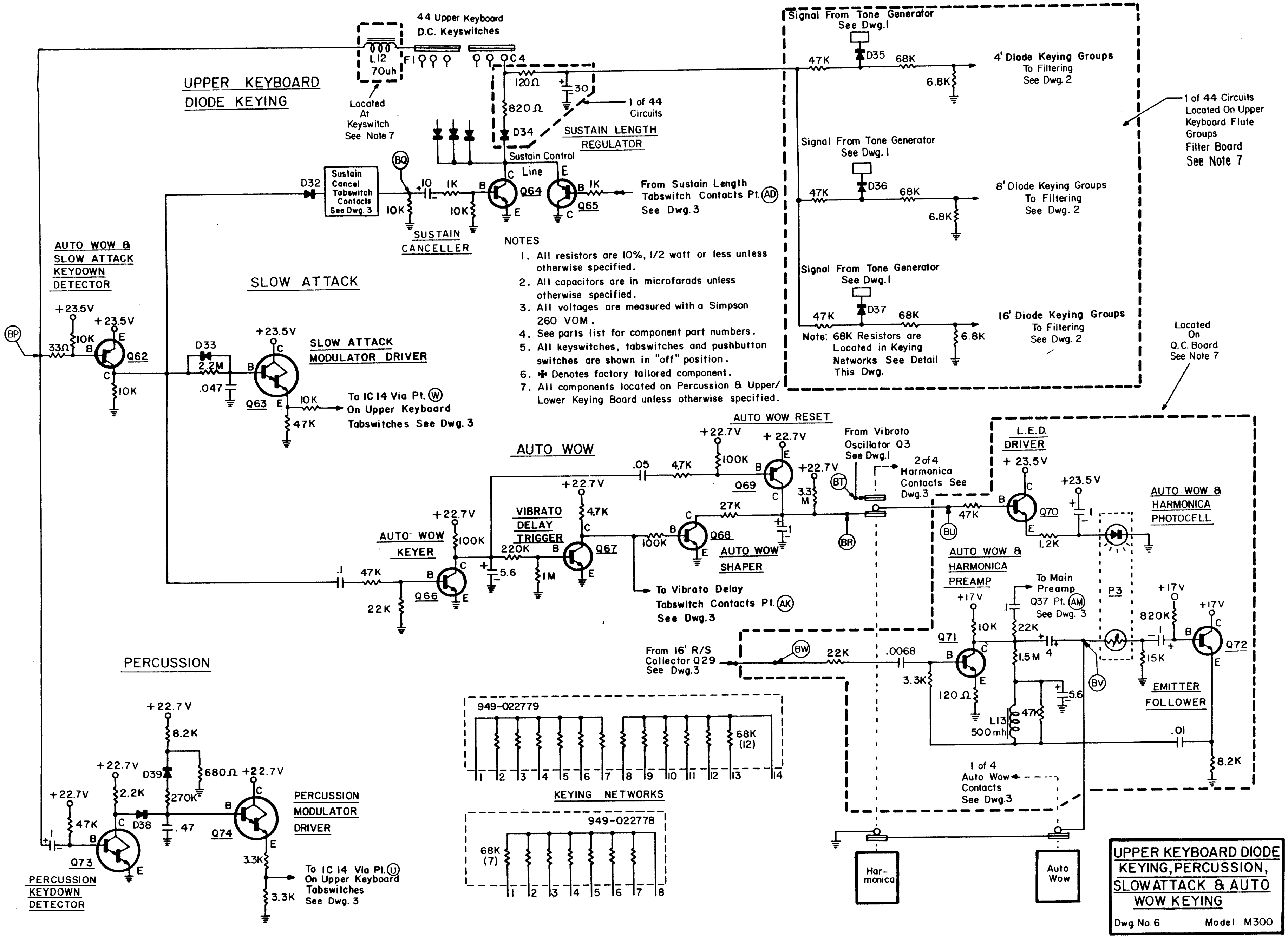
1. All resistors are 10%, 1/2 watt or less unless otherwise specified.
2. All capacitors are in microfarads unless otherwise specified.
3. All voltages measured to ground with a Simpson 260 VOM.
4. See Parts List for component part numbers.
5. All Keyswitches, Tabswitches and Pushbutton Switches shown in "off" position.
6. ✱ Denotes factory tailored component.
7. All components located on Tone Generator & Pedal Board unless otherwise specified.

BASS PEDALS

Dwg. No. 5

M300

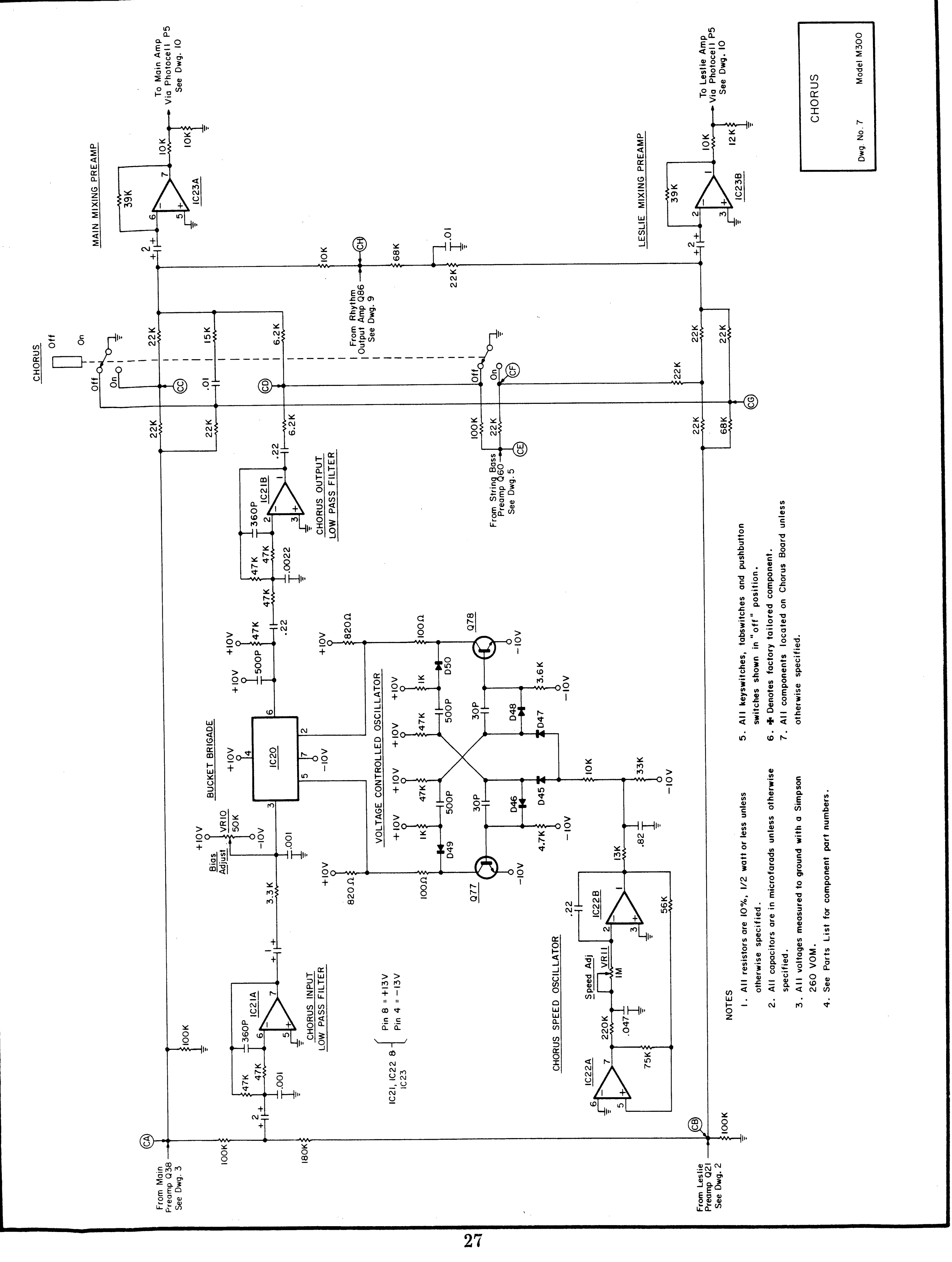
SCHEMATIC 6


UPPER KEYBOARD DIODE KEYING, PERCUSSION, SLOW ATTACK & AUTO WOW KEYING
Dwg. No. 6
Model M300
UPPER KEYBOARD
DIODE KEYING
44 Upper Keyboard
D.C. Keyswitches
L12
70uh
Located At Keyswitch See Note 7
F1
C4
120Ω
820Ω
30
D34
1 of 44 Circuits
SUSTAIN LENGTH REGULATOR
Sustain Control Line
Q64
Q65
1K
From Sustain Length Tabswitch Contacts Pt. (AD) See Dwg. 3
Sustain Cancel Tabswitch Contacts See Dwg. 3
D32
(BQ)
10
1K
10K
10K
SUSTAIN CANCELLER
Signal From Tone Generator See Dwg. 1
D35
47K
68K
6.8K
4' Diode Keying Groups To Filtering See Dwg. 2
D36
8' Diode Keying Groups To Filtering See Dwg. 2
D37
16' Diode Keying Groups To Filtering See Dwg. 2
Note: 68K Resistors are Located in Keying Networks See Detail This Dwg.
1 of 44 Circuits Located On Upper Keyboard Flute Groups Filter Board See Note 7
Located On Q.C. Board See Note 7
AUTO WOW & SLOW ATTACK KEYDOWN DETECTOR
(BP)
33Ω
10K
+23.5V
Q62
SLOW ATTACK
D33
2.2M
.047
Q63
SLOW ATTACK MODULATOR DRIVER
47K
To IC 14 Via Pt. (W) On Upper Keyboard Tabswitches See Dwg. 3
AUTO WOW
AUTO WOW KEYER
Q66
.1
22K
100K
+22.7V
5.6
220K
1M
VIBRATO DELAY TRIGGER
Q67
4.7K
100K
Q68
AUTO WOW SHAPER
To Vibrato Delay Tabswitch Contacts Pt. (AK) See Dwg. 3
.05
AUTO WOW RESET
Q69
27K
3.3M
From Vibrato Oscillator Q3 See Dwg. 1
(BT)
2 of 4 Harmonica Contacts See Dwg. 3
(BR)
(BU)
L.E.D. DRIVER
+23.5V
Q70
1.2K
AUTO WOW & HARMONICA PHOTOCELL
P3
AUTO WOW & HARMONICA PREAMP
+17V
Q71
To Main Preamp Q37 Pt. (AM) See Dwg. 3
1.5M
4
120Ω
3.3K
.0068
L13
500mh
(BV)
(BW)
From 16' R/S Collector Q29 See Dwg. 3
820K
15K
Q72
EMITTER FOLLOWER
.01
8.2K
1 of 4 Auto Wow Contacts See Dwg. 3
Har-monica
Auto Wow
PERCUSSION
+22.7V
8.2K
2.2K
D39
680Ω
270K
D38
.47
Q73
PERCUSSION KEYDOWN DETECTOR
Q74
PERCUSSION MODULATOR DRIVER
3.3K
To IC 14 Via Pt. (U) On Upper Keyboard Tabswitches See Dwg. 3
949-022779
68K (12)
KEYING NETWORKS
949-022778
68K (7)

NOTES

1. All resistors are 10%, 1/2 watt or less unless otherwise specified.
2. All capacitors are in microfarads unless otherwise specified.
3. All voltages are measured with a Simpson 260 VOM.
4. See parts list for component part numbers.
5. All keyswitches, tabswitches and pushbutton switches are shown in "off" position.
6. ✚ Denotes factory tailored component.
7. All components located on Percussion & Upper/Lower Keying Board unless otherwise specified.

SCHEMATIC 7

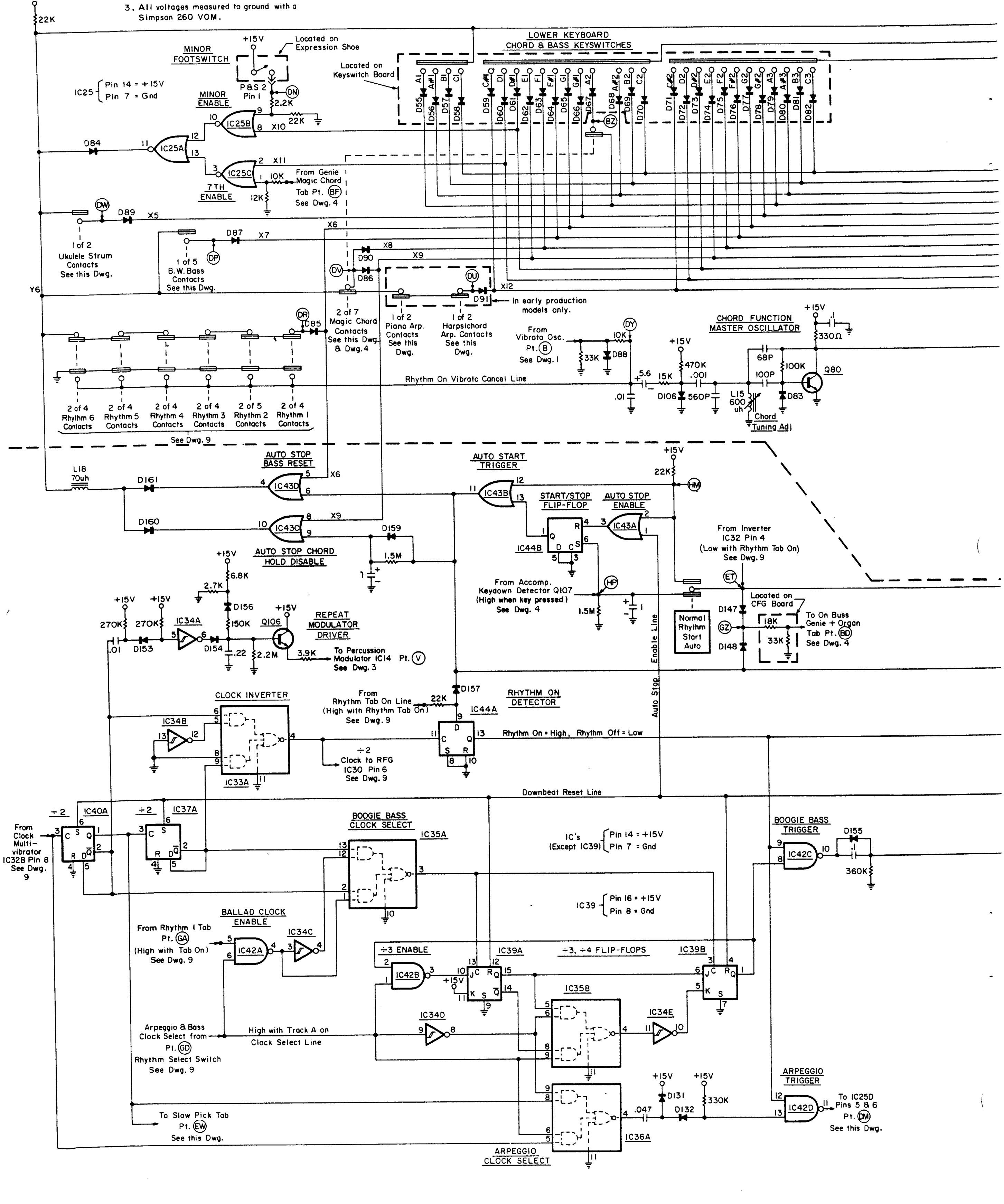

CHORUS
Dwg. No. 7
Model M300
MAIN MIXING PREAMP
LESLIE MIXING PREAMP
To Main Amp Via Photocell P5 See Dwg. 10
To Leslie Amp Via Photocell P5 See Dwg. 10
From Rhythm Output Amp Q86 See Dwg. 9
From String Bass Preamp Q60 See Dwg. 5
From Main Preamp Q38 See Dwg. 3
From Leslie Preamp Q21 See Dwg. 2
CHORUS
Off
On
CHORUS OUTPUT LOW PASS FILTER
CHORUS INPUT LOW PASS FILTER
BUCKET BRIGADE
VOLTAGE CONTROLLED OSCILLATOR
CHORUS SPEED OSCILLATOR
Bias Adjust
VR10 50K
Speed Adj VR11 1M
IC20
IC21A
IC21B
IC22A
IC22B
IC23A
IC23B
Q77
Q78
D45
D46
D47
D48
D49
D50
CA
CB
CC
CD
CE
CF
CG
CH
+10V
-10V
IC21, IC22 & IC23
Pin 8 = +13V
Pin 4 = -13V

NOTES

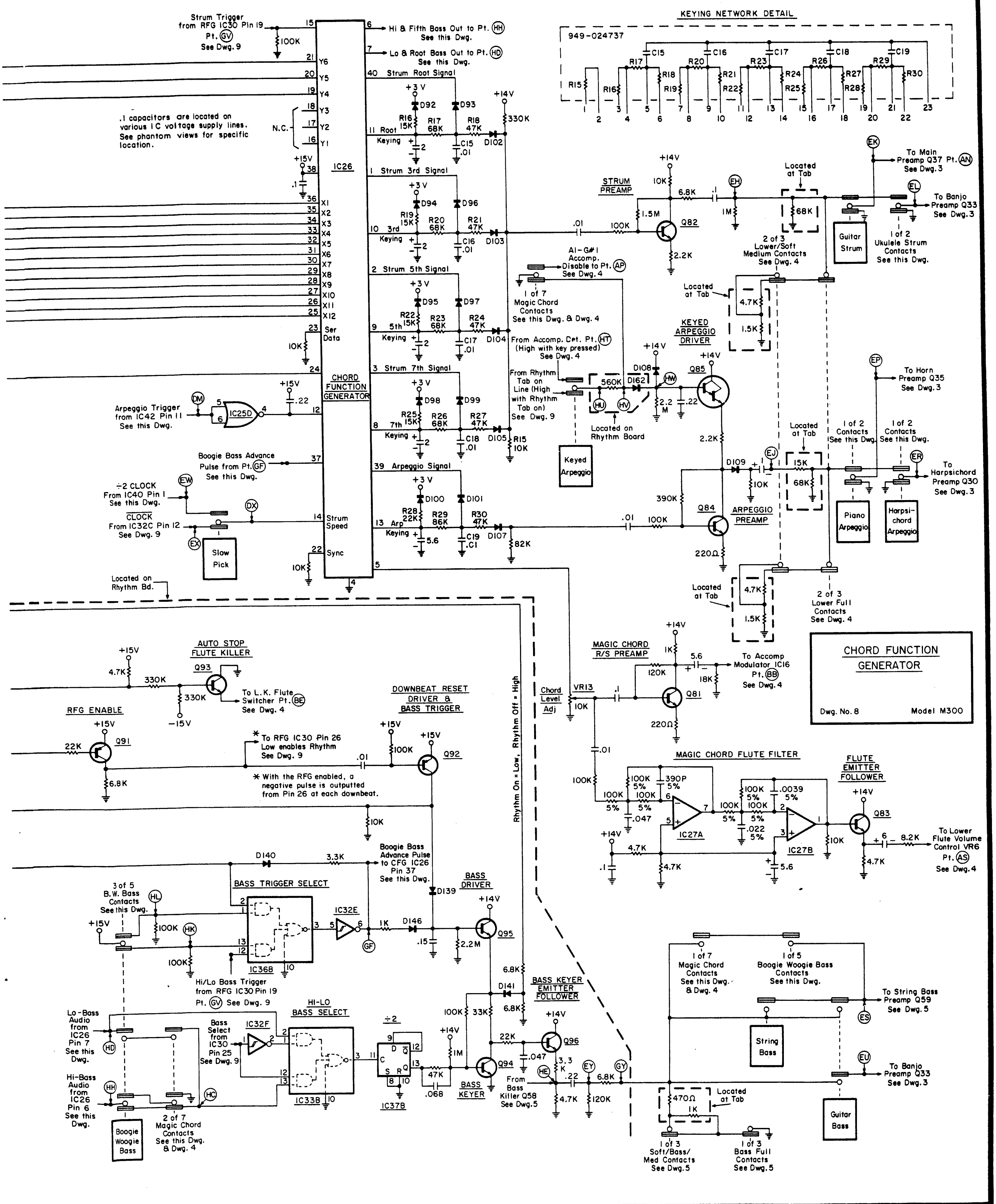
1. All resistors are 10%, 1/2 watt or less unless otherwise specified.
2. All capacitors are in microfarads unless otherwise specified.
3. All voltages measured to ground with a Simpson 260 VOM.
4. See Parts List for component part numbers.
5. All keyswitches, tabswitches and pushbutton switches shown in "off" position.
6. ✱ Denotes factory tailored component.
7. All components located on Chorus Board unless otherwise specified.

SCHEMATIC 8

NOTES
1. All resistors are 10%, 1/2 watt or less unless otherwise specified.
2. All capacitors are in microfarads unless otherwise specified.
3. All voltages measured to ground with a Simpson 260 VOM.
4. See parts list for component part numbers.
5. All keyswitches, tabswitches and pushbutton switches are shown in "off" position.
6. ✚ Denotes factory tailored equipment.
7. All components located on Chord Function Generator Board unless otherwise specified.
8. Resistors with "R" numbers and capacitors with "C" numbers are contained in network.

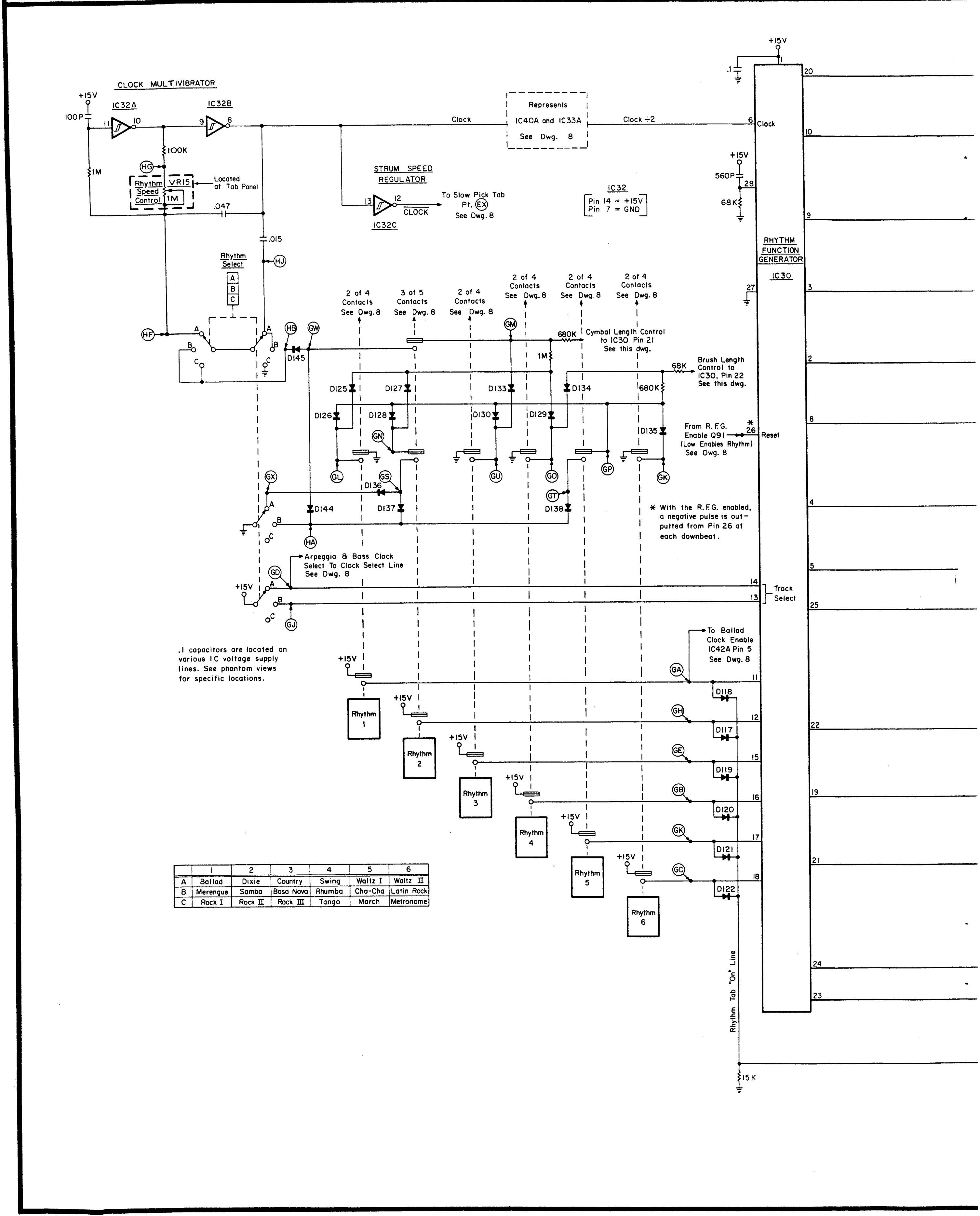

+15V
22K
IC25 Pin 14 = +15V
Pin 7 = Gnd
MINOR FOOTSWITCH
Located on Expression Shoe
P&S 2 Pin 1
MINOR ENABLE
IC25B
IC25A
IC25C
7TH ENABLE
D84
X10
X11
2.2K
22K
10K
12K
From Genie Magic Chord Tab Pt. BF See Dwg. 4
LOWER KEYBOARD CHORD & BASS KEYSWITCHES
Located on Keyswitch Board
A1 A#1 B1 C1 C#1 D1 D#1 E1 F1 F#1 G1 G#1 A2 A#2 B2 C2 C#2 D2 D#2 E2 F2 F#2 G2 G#2 A3 A#3 B3 C3
D55 D56 D57 D58 D59 D60 D61 D62 D63 D64 D65 D66 D67 D68 D69 D70 D71 D72 D73 D74 D75 D76 D77 D78 D79 D80 D81 D82
BZ
DN
DW
D89
X5
1 of 2 Ukulele Strum Contacts See this Dwg.
D87
X7
DP
1 of 5 B.W. Bass Contacts See this Dwg.
X6
X8
D90
D86
X9
DV
DU
D91
X12
In early production models only.
Y6
DR
D85
2 of 7 Magic Chord Contacts See this Dwg. & Dwg. 4
1 of 2 Piano Arp. Contacts See this Dwg.
1 of 2 Harpsichord Arp. Contacts See this Dwg.
2 of 4 Rhythm 6 Contacts
2 of 4 Rhythm 5 Contacts
2 of 4 Rhythm 4 Contacts
2 of 4 Rhythm 3 Contacts
2 of 5 Rhythm 2 Contacts
2 of 4 Rhythm 1 Contacts
See Dwg. 9
From Vibrato Osc. Pt. B See Dwg. 1
DY
10K
33K
D88
Rhythm On Vibrato Cancel Line
5.6
.01
15K
.001
D106
560P
470K
CHORD FUNCTION MASTER OSCILLATOR
68P
100P
100K
330Ω
Q80
L15 600 uh
D83
Chord Tuning Adj
L18 70uh
D161
D160
AUTO STOP BASS RESET
IC43D
IC43C
D159
1.5M
AUTO STOP CHORD HOLD DISABLE
AUTO START TRIGGER
IC43B
HM
START/STOP FLIP-FLOP
IC44B
AUTO STOP ENABLE
IC43A
From Inverter IC32 Pin 4 (Low with Rhythm Tab On) See Dwg. 9
From Accomp. Keydown Detector Q107 (High when key pressed) See Dwg. 4
HP
1.5M
ET
Normal Rhythm Start Auto
Enable Line
Auto Stop
Located on CFG Board
D147
D148
GZ
18K
33K
To On Buss Genie + Organ Tab Pt. BD See Dwg. 4
6.8K
2.7K
D156
150K
Q106
REPEAT MODULATOR DRIVER
270K
IC34A
D153
D154
.22
2.2M
3.9K
To Percussion Modulator IC14 Pt. V See Dwg. 3
D157
From Rhythm Tab On Line (High with Rhythm Tab On) See Dwg. 9
RHYTHM ON DETECTOR
IC44A
Rhythm On = High, Rhythm Off = Low
CLOCK INVERTER
IC34B
IC33A
÷2 Clock to RFG IC30 Pin 6 See Dwg. 9
Downbeat Reset Line
÷2 IC40A
÷2 IC37A
From Clock Multi-vibrator IC32B Pin 8 See Dwg. 9
BOOGIE BASS CLOCK SELECT
IC35A
IC's (Except IC39) Pin 14 = +15V Pin 7 = Gnd
IC39 Pin 16 = +15V Pin 8 = Gnd
BOOGIE BASS TRIGGER
IC42C
D155
360K
BALLAD CLOCK ENABLE
From Rhythm 1 Tab Pt. GA (High with Tab On) See Dwg. 9
IC42A
IC34C
÷3 ENABLE
IC42B
IC39A
÷3, ÷4 FLIP-FLOPS
IC39B
IC35B
IC34D
IC34E
Arpeggio & Bass Clock Select from Pt. GD Rhythm Select Switch See Dwg. 9
High with Track A on Clock Select Line
D131
D132
330K
.047
ARPEGGIO TRIGGER
IC42D
To IC25D Pins 5 & 6 Pt. DM See this Dwg.
To Slow Pick Tab Pt. EW See this Dwg.
IC36A
ARPEGGIO CLOCK SELECT

SCHEMATIC 8



Strum Trigger from RFG IC30 Pin 19 Pt. GV See Dwg. 9
100K
Y6
Y5
Y4
Y3
Y2
Y1
.1 capacitors are located on various IC voltage supply lines. See phantom views for specific location.
N.C.
+15V
IC26
X1
X2
X3
X4
X5
X6
X7
X8
X9
X10
X11
X12
Ser Data
10K
CHORD FUNCTION GENERATOR
Arpeggio Trigger from IC42 Pin 11 See this Dwg.
DM
IC25D
.22
Boogie Bass Advance Pulse from Pt. GF See this Dwg.
÷2 CLOCK From IC40 Pin 1 See this Dwg.
EW
CLOCK From IC32C Pin 12 See Dwg. 9
DX
EX
Slow Pick
Strum Speed
Sync
Located on Rhythm Bd.
Hi & Fifth Bass Out to Pt. HH See this Dwg.
Lo & Root Bass Out to Pt. HD See this Dwg.
40 Strum Root Signal
+3V
D92
D93
+14V
R16 15K
R17 68K
R18 47K
330K
11 Root
Keying
C15 .01
D102
1 Strum 3rd Signal
D94
D96
R19 15K
R20 68K
R21 47K
10 3rd
C16 .01
D103
2 Strum 5th Signal
D95
D97
R22 15K
R23 68K
R24 47K
9 5th
C17 .01
D104
3 Strum 7th Signal
D98
D99
R25 15K
R26 68K
R27 47K
8 7th
C18 .01
D105
R15 10K
39 Arpeggio Signal
D100
D101
R28 22K
R29 86K
R30 47K
13 Arp
5.6
C19 .C1
D107
82K
KEYING NETWORK DETAIL
949-024737
C15
C16
C17
C18
C19
R15
R16
R17
R18
R19
R20
R21
R22
R23
R24
R25
R26
R27
R28
R29
R30
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23
STRUM PREAMP
+14V
10K
6.8K
.1
EH
1M
1.5M
.01
100K
Q82
2.2K
Located at Tab
68K
EK
To Main Preamp Q37 Pt. AN See Dwg. 3
EL
To Banjo Preamp Q33 See Dwg. 3
Guitar Strum
1 of 2 Ukulele Strum Contacts See this Dwg.
2 of 3 Lower/Soft Medium Contacts See Dwg. 4
A1-G#1 Accomp. Disable to Pt. AP See Dwg. 4
1 of 7 Magic Chord Contacts See this Dwg. & Dwg. 4
From Accomp. Det. Pt. HT (High with key pressed) See Dwg. 4
From Rhythm Tab on Line (High with Rhythm Tab on) See Dwg. 9
Keyed Arpeggio
560K
D162
D108
HU
HV
HW
Located on Rhythm Board
2.2 M
.22
KEYED ARPEGGIO DRIVER
Q85
4.7K
1.5K
EP
To Horn Preamp Q35 See Dwg. 3
2.2K
D109
EJ
15K
68K
10K
390K
Q84
ARPEGGIO PREAMP
220Ω
1 of 2 Contacts See this Dwg.
1 of 2 Contacts See this Dwg.
ER
To Harpsichord Preamp Q30 See Dwg. 3
Piano Arpeggio
Harpsichord Arpeggio
Located at Tab
2 of 3 Lower Full Contacts See Dwg. 4
MAGIC CHORD R/S PREAMP
+14V
1K
5.6
120K
18K
To Accomp Modulator IC16 Pt. BB See Dwg. 4
Chord Level Adj
VR13
10K
Q81
220Ω
Rhythm On = Low, Rhythm Off = High
CHORD FUNCTION GENERATOR
Dwg. No. 8
Model M300
MAGIC CHORD FLUTE FILTER
100K
100K 5%
390P 5%
100K 5%
100K 5%
.047
IC27A
100K 5%
.0039 5%
100K 5%
.022 5%
IC27B
4.7K
5.6
FLUTE EMITTER FOLLOWER
Q83
10K
6.8K
4.7K
To Lower Flute Volume Control VR6 Pt. AS See Dwg. 4
AUTO STOP FLUTE KILLER
+15V
4.7K
330K
330K
Q93
To L.K. Flute Switcher Pt. BE See Dwg. 4
-15V
RFG ENABLE
22K
Q91
6.8K
To RFG IC30 Pin 26 Low enables Rhythm See Dwg. 9
* With the RFG enabled, a negative pulse is outputted from Pin 26 at each downbeat.
DOWNBEAT RESET DRIVER & BASS TRIGGER
100K
Q92
10K
D140
3.3K
Boogie Bass Advance Pulse to CFG IC26 Pin 37 See this Dwg.
BASS TRIGGER SELECT
3 of 5 B.W. Bass Contacts See this Dwg.
HL
HK
IC36B
IC32E
GF
1K
D146
.15
2.2M
BASS DRIVER
D139
Q95
Hi/Lo Bass Trigger from RFG IC30 Pin 19 Pt. GV See Dwg. 9
Lo-Bass Audio from IC26 Pin 7 See this Dwg.
HD
Hi-Bass Audio from IC26 Pin 6 See this Dwg.
HH
HC
Boogie Woogie Bass
2 of 7 Magic Chord Contacts See this Dwg. & Dwg. 4
HI-LO BASS SELECT
Bass Select from IC30 Pin 25 See Dwg. 9
IC32F
IC33B
÷2
IC37B
47K
.068
1M
BASS KEYER
Q94
100K
33K
6.8K
D141
6.8K
BASS KEYER EMITTER FOLLOWER
22K
Q96
.047
3.3K
HE
EY
GY
.22
6.8K
4.7K
120K
From Bass Killer Q58 See Dwg. 5
1 of 7 Magic Chord Contacts See this Dwg. & Dwg. 4
1 of 5 Boogie Woogie Bass Contacts See this Dwg.
To String Bass Preamp Q59 See Dwg. 5
ES
String Bass
EU
To Banjo Preamp Q33 See Dwg. 3
Guitar Bass
470Ω
1K
Located at Tab
1 of 3 Soft/Bass/Med Contacts See Dwg. 5
1 of 3 Bass Full Contacts See Dwg. 5

SCHEMATIC 9

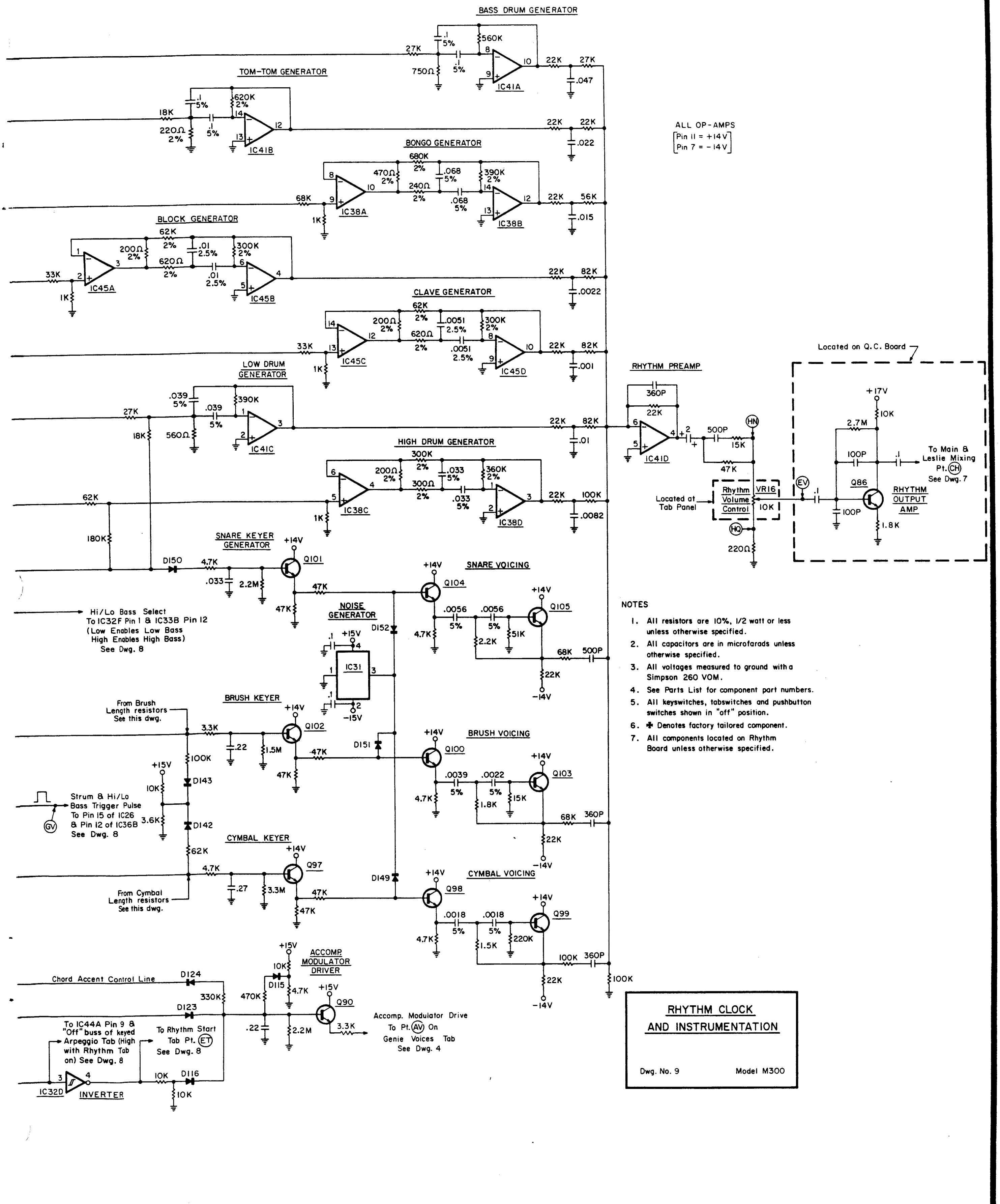

CLOCK MULTIVIBRATOR
+15V
IC32A
IC32B
100P
11
10
9
8
100K
1M
HG
Rhythm Speed Control
VR15
1M
Located at Tab Panel
.047
.015
HJ
Rhythm Select
A
B
C
HF
HB
GW
D145
Clock
Represents IC40A and IC33A See Dwg. 8
Clock ÷2
STRUM SPEED REGULATOR
13
12
CLOCK
IC32C
To Slow Pick Tab Pt. EX See Dwg. 8
IC32
Pin 14 = +15V
Pin 7 = GND
2 of 4 Contacts See Dwg. 8
3 of 5 Contacts See Dwg. 8
GM
680K
Cymbal Length Control to IC30 Pin 21 See this dwg.
1M
68K
Brush Length Control to IC30, Pin 22 See this dwg.
680K
D125
D127
D133
D134
D126
D128
D130
D129
D135
GN
GL
GU
GO
GP
GK
GX
GS
D136
GT
D144
D137
D138
HA
Arpeggio & Bass Clock Select To Clock Select Line See Dwg. 8
GD
GJ
From R.F.G. Enable Q91 (Low Enables Rhythm) See Dwg. 8
*
26
Reset
14
13
Track Select
+15V
.1
560P
28
68K
27
Clock
6
RHYTHM FUNCTION GENERATOR
IC30
20
10
9
3
2
8
4
5
25
22
19
21
24
23
To Ballad Clock Enable IC42A Pin 5 See Dwg. 8
GA
GH
GE
GB
GK
GC
11
12
15
16
17
18
D118
D117
D119
D120
D121
D122
Rhythm 1
Rhythm 2
Rhythm 3
Rhythm 4
Rhythm 5
Rhythm 6
Rhythm Tab "On" Line
15K

	1	2	3	4	5	6
A	Ballad	Dixie	Country	Swing	Waltz I	Waltz II
B	Merengue	Samba	Bosa Nova	Rhumba	Cha-Cha	Latin Rock
C	Rock I	Rock II	Rock III	Tango	March	Metronome

.1 capacitors are located on various IC voltage supply lines. See phantom views for specific locations.

* With the R.F.G. enabled, a negative pulse is outputted from Pin 26 at each downbeat.

SCHEMATIC 9


BASS DRUM GENERATOR
27K
750Ω
.1 5%
560K
IC41A
22K
27K
.047
TOM-TOM GENERATOR
18K
220Ω 2%
620K 2%
IC41B
22K
.022
BONGO GENERATOR
680K 2%
470Ω 2%
240Ω 2%
.068 5%
390K 2%
68K
1K
IC38A
IC38B
56K
.015
BLOCK GENERATOR
62K 2%
200Ω 2%
620Ω 2%
.01 2.5%
300K 2%
33K
IC45A
IC45B
82K
.0022
CLAVE GENERATOR
.0051 2.5%
IC45C
IC45D
.001
LOW DRUM GENERATOR
.039 5%
390K
560Ω
18K
27K
IC41C
.01
HIGH DRUM GENERATOR
300K 2%
300Ω 2%
.033 5%
360K 2%
62K
180K
IC38C
IC38D
100K
.0082
ALL OP-AMPS
Pin 11 = +14V
Pin 7 = -14V
RHYTHM PREAMP
360P
22K
IC41D
500P
15K
47K
HN
Located at Tab Panel
Rhythm Volume Control
VR16
10K
HQ
220Ω
Located on Q.C. Board
+17V
2.7M
10K
100P
.1
To Main & Leslie Mixing Pt. CH See Dwg. 7
EV
Q86
RHYTHM OUTPUT AMP
1.8K
SNARE KEYER GENERATOR
+14V
D150
4.7K
.033
2.2M
Q101
47K
SNARE VOICING
Q104
.0056 5%
2.2K
51K
Q105
68K
500P
22K
-14V
Hi/Lo Bass Select
To IC32F Pin 1 & IC33B Pin 12
(Low Enables Low Bass
High Enables High Bass)
See Dwg. 8
NOISE GENERATOR
+15V
IC31
-15V
D152
D151
From Brush Length resistors See this dwg.
BRUSH KEYER
3.3K
.22
1.5M
Q102
100K
D143
D142
+15V
10K
3.6K
Strum & Hi/Lo Bass Trigger Pulse
To Pin 15 of IC26 & Pin 12 of IC36B
See Dwg. 8
GV
BRUSH VOICING
Q100
.0039 5%
.0022 5%
1.8K
15K
Q103
68K
360P
CYMBAL KEYER
62K
.27
3.3M
Q97
From Cymbal Length resistors See this dwg.
D149
CYMBAL VOICING
Q98
.0018 5%
1.5K
220K
Q99
100K
360P
100K
ACCOMP. MODULATOR DRIVER
D115
4.7K
470K
330K
Chord Accent Control Line
D124
D123
.22
2.2M
Q90
3.3K
Accomp. Modulator Drive To Pt. AV On Genie Voices Tab See Dwg. 4
To IC44A Pin 9 & "Off" buss of keyed Arpeggio Tab (High with Rhythm Tab on) See Dwg. 8
To Rhythm Start Tab Pt. ET See Dwg. 8
IC32D
INVERTER
D116

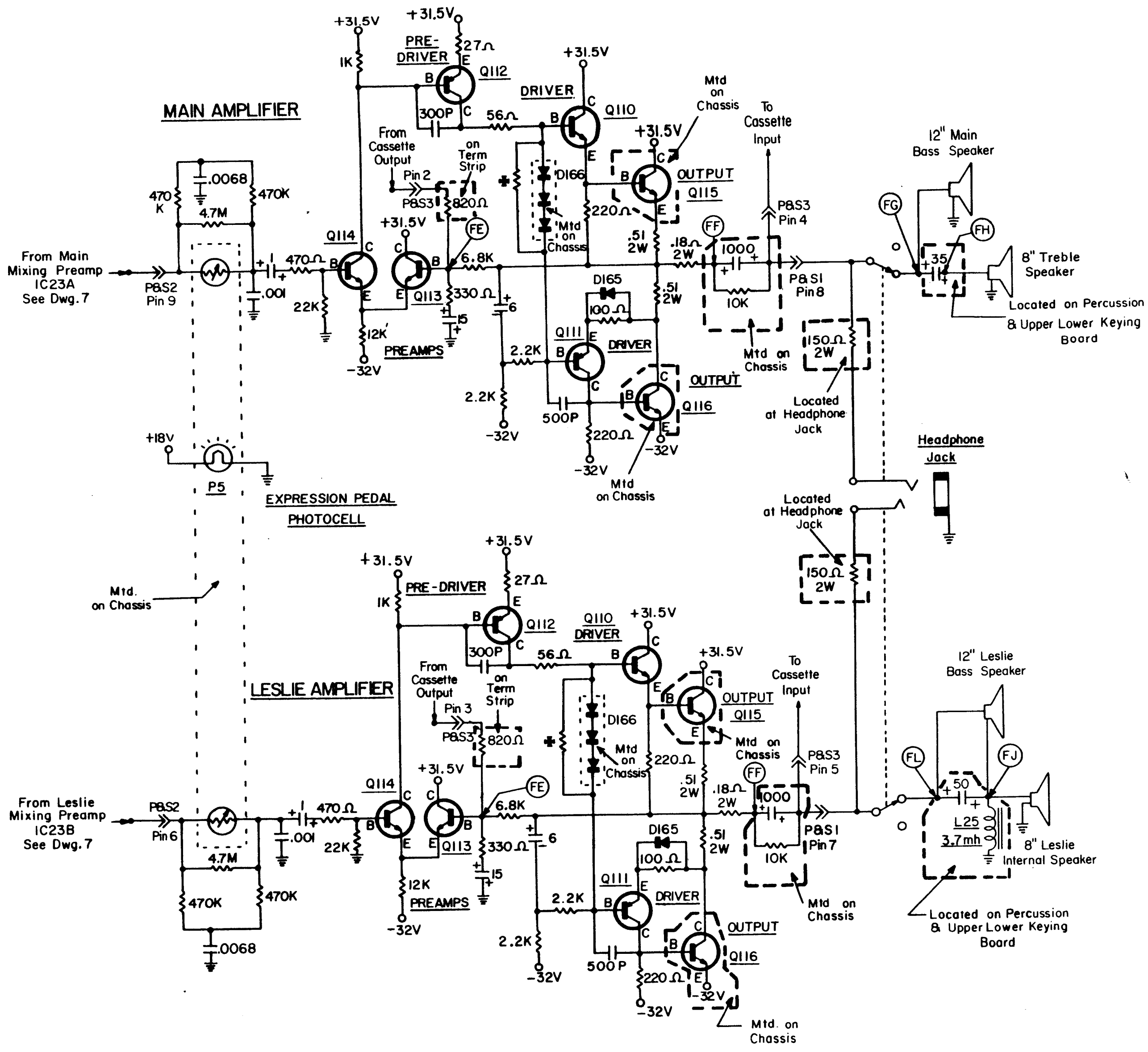
NOTES

1. All resistors are 10%, 1/2 watt or less unless otherwise specified.
2. All capacitors are in microfarads unless otherwise specified.
3. All voltages measured to ground with a Simpson 260 VOM.
4. See Parts List for component part numbers.
5. All keyswitches, tabswitches and pushbutton switches shown in "off" position.
6. ✚ Denotes factory tailored component.
7. All components located on Rhythm Board unless otherwise specified.

RHYTHM CLOCK
AND INSTRUMENTATION

Dwg. No. 9 Model M300

SCHEMATIC 10


MAIN AMPLIFIER
From Main Mixing Preamp IC23A See Dwg.7
P&S2 Pin 9
470 K
.0068
470K
4.7M
.001
470Ω
22K
Q114
Q113
+31.5V
1K
PRE-DRIVER
27Ω
Q112
300P
56Ω
From Cassette Output
Pin 2
P&S3
820Ω
on Term Strip
FE
6.8K
330Ω
15
6
12K
PREAMPS
-32V
DRIVER
Q110
D166
Mtd on Chassis
220Ω
OUTPUT
Q115
.51 2W
.18Ω 2W
FF
1000
10K
P&S1 Pin8
To Cassette Input
P&S3 Pin 4
D165
100Ω
Q111
2.2K
500P
Q116
Mtd on Chassis
150Ω 2W
Located at Headphone Jack
Headphone Jack
12" Main Bass Speaker
FG
FH
35
8" Treble Speaker
Located on Percussion & Upper Lower Keying Board
+18V
P5
EXPRESSION PEDAL PHOTOCELL
Mtd. on Chassis
LESLIE AMPLIFIER
From Leslie Mixing Preamp IC23B See Dwg.7
P&S2 Pin 6
Pin 3
P&S1 Pin7
P&S3 Pin 5
12" Leslie Bass Speaker
FL
FJ
50
L25 3.7mh
8" Leslie Internal Speaker
Located on Percussion & Upper Lower Keying Board
Mtd. on Chassis

NOTES

1. All resistors are 10%, 1/2 watt or less unless otherwise specified.
2. All Capacitors are in microfarads unless otherwise specified.
3. All voltages measured to ground with a Simpson 260 VOM.
4. See Parts List for component part numbers.
5. All Keyswitches, Tabswitches and Pushbutton Switches shown in "off" position.
6. ✚ Denotes factory tailored component.
7. All Components Located on Amplifier Boards unless otherwise specified.

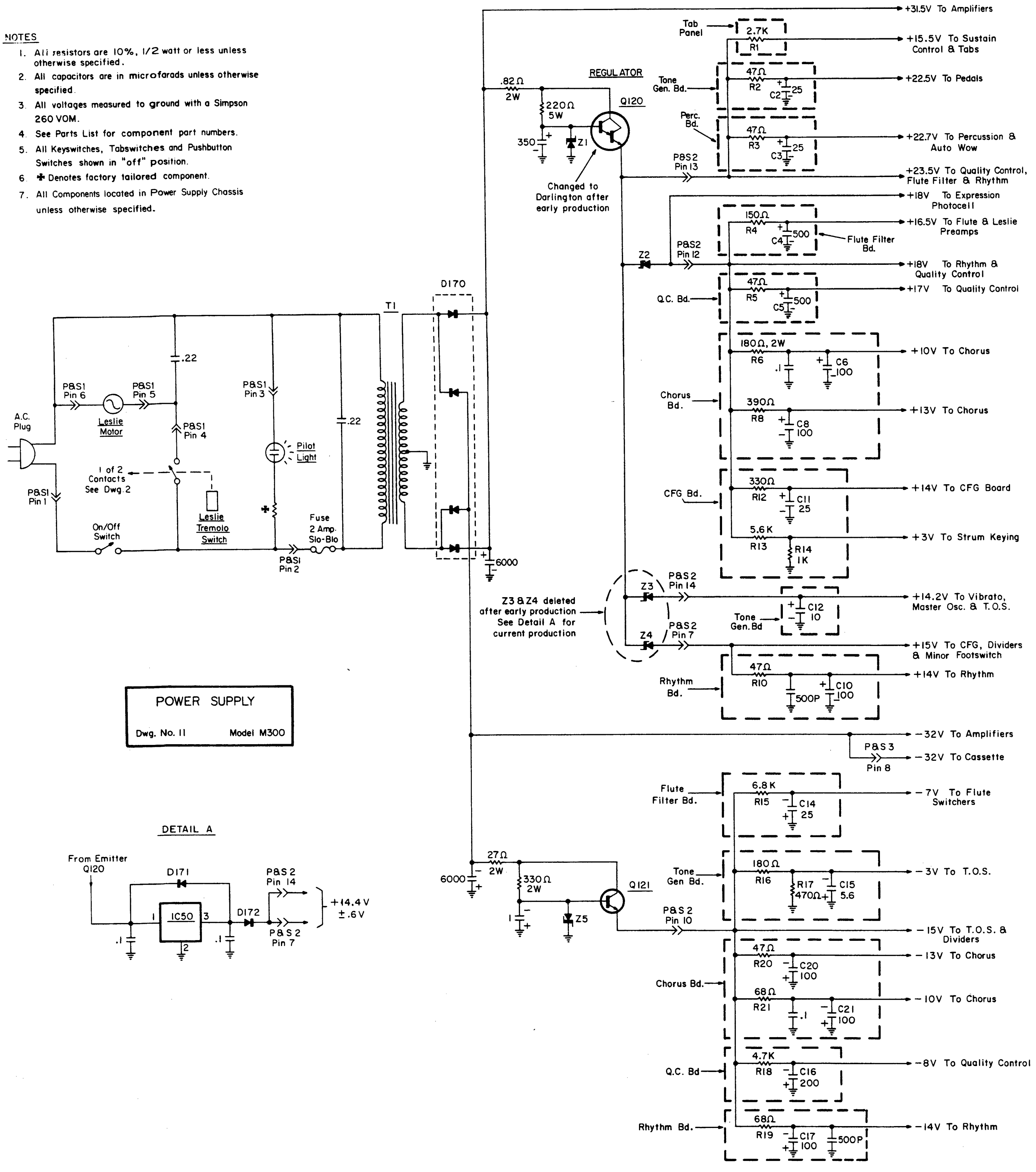
MAIN & LESLIE
AMPLIFIERS

Dwg. No. 10 Model M300

SCHEMATIC 11

NOTES

1. All resistors are 10%, 1/2 watt or less unless otherwise specified.
2. All capacitors are in microfarads unless otherwise specified.
3. All voltages measured to ground with a Simpson 260 VOM.
4. See Parts List for component part numbers.
5. All Keyswitches, Tabswitches and Pushbutton Switches shown in "off" position.
6. ✚ Denotes factory tailored component.
7. All Components located in Power Supply Chassis unless otherwise specified.



+31.5V To Amplifiers
Tab Panel
2.7K R1
+15.5V To Sustain Control & Tabs
Tone Gen. Bd.
47Ω R2 C2 25
+22.5V To Pedals
REGULATOR
.82Ω 2W
220Ω 5W
Q120
350
Z1
Perc. Bd.
47Ω R3 C3 25
+22.7V To Percussion & Auto Wow
P&S2 Pin 13
+23.5V To Quality Control, Flute Filter & Rhythm
Changed to Darlington after early production
+18V To Expression Photocell
150Ω R4 C4 500
+16.5V To Flute & Leslie Preamps
Flute Filter Bd.
Z2
P&S2 Pin 12
+18V To Rhythm & Quality Control
Q.C. Bd.
47Ω R5 C5 500
+17V To Quality Control
D170
T1
180Ω, 2W R6 .1 C6 100
+10V To Chorus
Chorus Bd.
390Ω R8 C8 100
+13V To Chorus
CFG Bd.
330Ω R12 C11 25
+14V To CFG Board
5.6K R13
R14 1K
+3V To Strum Keying
A.C. Plug
P&S1 Pin 6
P&S1 Pin 5
Leslie Motor
.22
P&S1 Pin 4
P&S1 Pin 1
1 of 2 Contacts See Dwg. 2
On/Off Switch
Leslie Tremolo Switch
P&S1 Pin 3
Pilot Light
✚
.22
Fuse 2 Amp. Slo-Blo
P&S1 Pin 2
6000
Z3 & Z4 deleted after early production See Detail A for current production
Z3
P&S2 Pin 14
Tone Gen. Bd
C12 10
+14.2V To Vibrato, Master Osc. & T.O.S.
Z4
P&S2 Pin 7
+15V To CFG, Dividers & Minor Footswitch
Rhythm Bd.
47Ω R10 500P C10 100
+14V To Rhythm
POWER SUPPLY
Dwg. No. 11
Model M300
-32V To Amplifiers
P&S3 Pin 8
-32V To Cassette
Flute Filter Bd.
6.8K R15 C14 25
-7V To Flute Switchers
DETAIL A
From Emitter Q120
D171
IC50
1
2
3
.1
.1
D172
P&S2 Pin 14
P&S2 Pin 7
+14.4V ±.6V
6000
27Ω 2W
330Ω 2W
1
Z5
Q121
Tone Gen Bd.
180Ω R16 R17 470Ω C15 5.6
-3V To T.O.S.
P&S2 Pin 10
-15V To T.O.S. & Dividers
Chorus Bd.
47Ω R20 C20 100
-13V To Chorus
68Ω R21 .1 C21 100
-10V To Chorus
Q.C. Bd
4.7K R18 C16 200
-8V To Quality Control
Rhythm Bd.
68Ω R19 C17 100 500P
-14V To Rhythm

TRANSISTOR BASING DIAGRAM

FIG. A

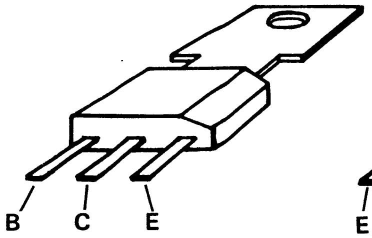


FIG. B

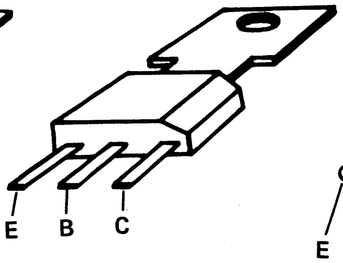


FIG. C

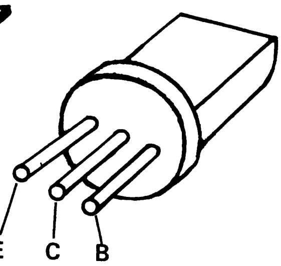


FIG. D

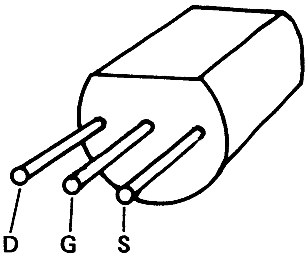


FIG. E

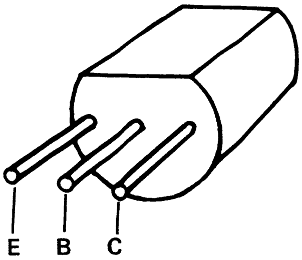


FIG. F

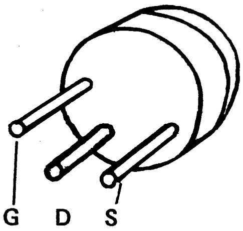


FIG. G

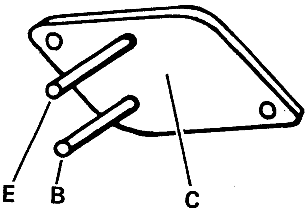


FIG. H

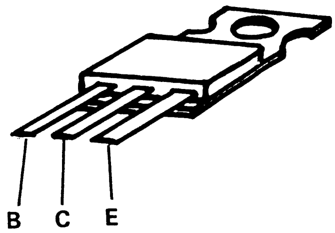


FIG. J

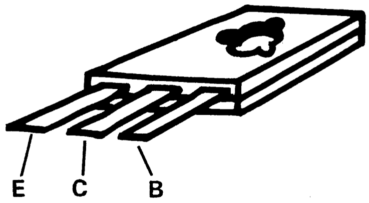


FIG. K

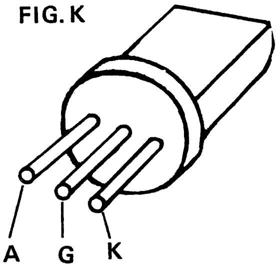


FIG. L

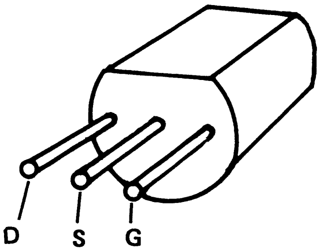
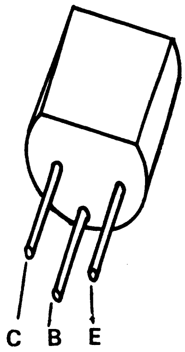


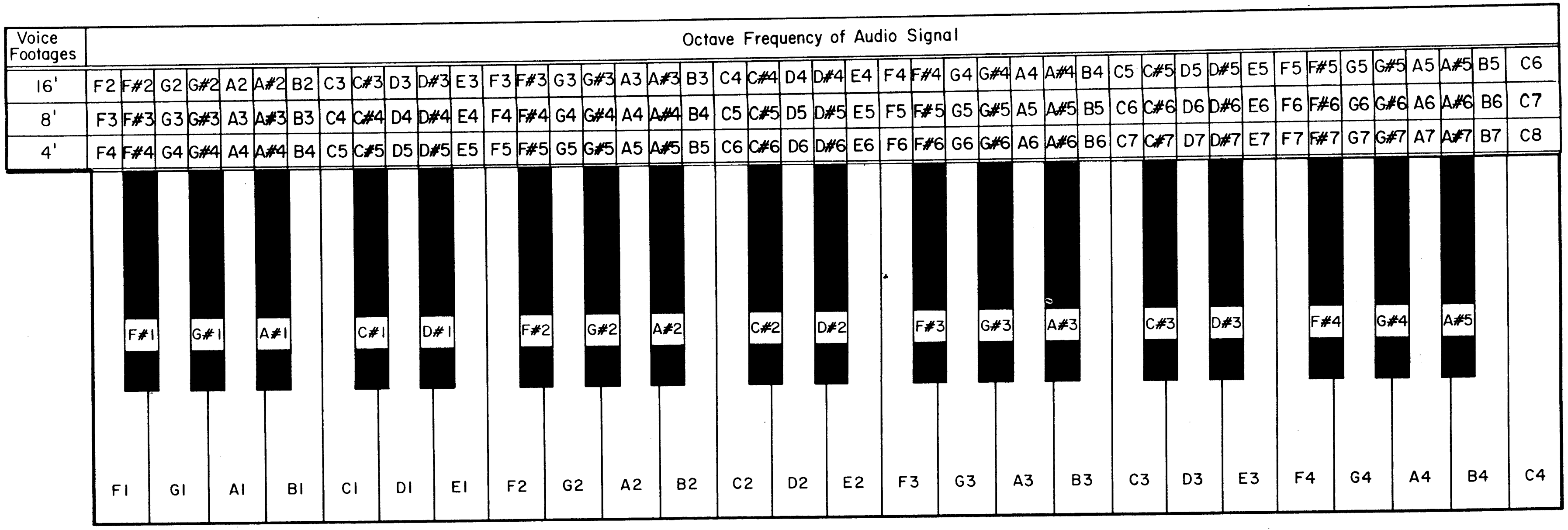
FIG. M



PART NUMBER	FIGURE	PART NUMBER	FIGURE	PART NUMBER	FIGURE	PART NUMBER	FIGURE
992-001192	G	991-012328	F	991-016727	C	992-024185	G
991-002232	C	991-012396	F	991-016788	C	991-024184	C
991-002271	G	991-012686	F	992-017169	G	991-025535	E or M
991-002298	C	992-013170	A	991-017456	F	991-026039	G
991-002356	C	991-013543	C	991-018238	C	991-026040	G
991-002873	C	991-013544	C	991-018047	E	991-026028	G
991-002888	C	991-013599	C	991-018237	B	991-026054	C
992-003139	G	991-015000	A	991-018493	E	991-026617	C
991-003304	C	991-015001	A	992-020432	G	991-026315	C
991-008393	C	991-015062	A	991-020425	H		
991-008394	C	991-015063	A	991-020426	H		
992-008890	G	991-015316	K	992-022201	G		
991-010098	C	991-015587	C	991-021451	J		
991-010462	C	991-015614	C	991-021450	J		
991-011576	D	991-015663	C	992-022773	G		
991-011706	D	991-016274	C	991-022774	L		

FREQUENCY DISTRIBUTION CHART

UPPER KEYBOARD

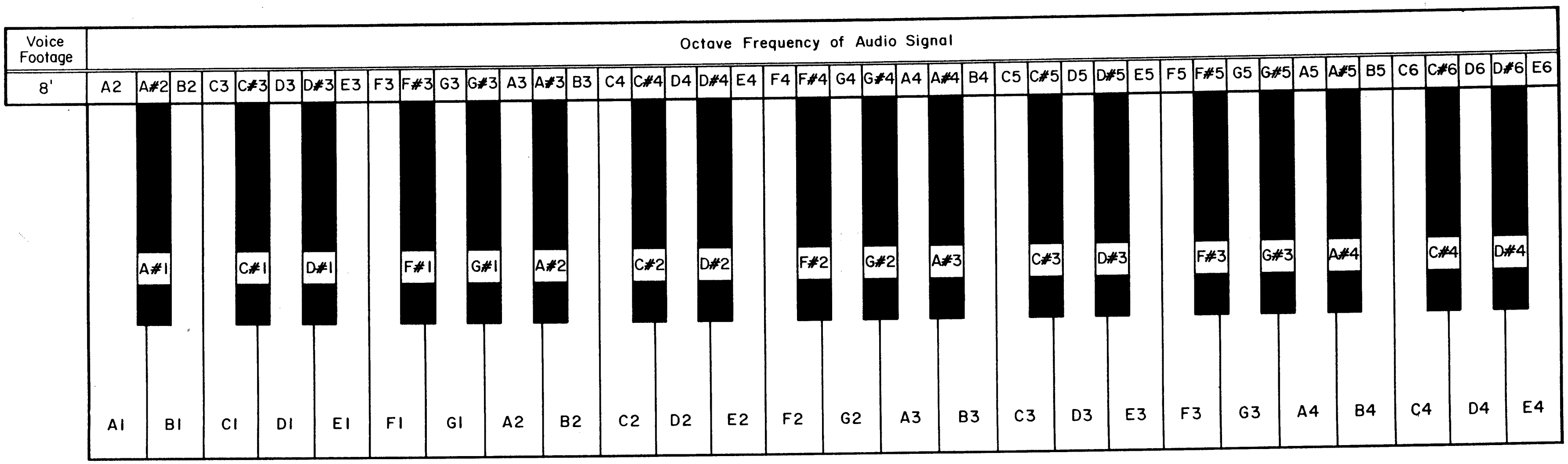


Octave Frequency of Audio Signal

Voice Footages																						
16'	F2	F#2	G2	G#2	A2	A#2	B2	C3	C#3	D3	D#3	E3	F3	F#3	G3	G#3	A3	A#3	B3	C4	C#4	D4
8'	F3	F#3	G3	G#3	A3	A#3	B3	C4	C#4	D4	D#4	E4	F4	F#4	G4	G#4	A4	A#4	B4	C5	C#5	D5
4'	F4	F#4	G4	G#4	A4	A#4	B4	C5	C#5	D5	D#5	E5	F5	F#5	G5	G#5	A5	A#5	B5	C6	C#6	D6
	F1	F#1	G1	G#1	A1	A#1	B1	C1	C#1	D1	D#1	E1	F2	F#2	G2	G#2	A2	A#2	B2	C2	C#2	D2

Voice Footages																						
16'	D#4	E4	F4	F#4	G4	G#4	A4	A#4	B4	C5	C#5	D5	D#5	E5	F5	F#5	G5	G#5	A5	A#5	B5	C6
8'	D#5	E5	F5	F#5	G5	G#5	A5	A#5	B5	C6	C#6	D6	D#6	E6	F6	F#6	G6	G#6	A6	A#6	B6	C7
4'	D#6	E6	F6	F#6	G6	G#6	A6	A#6	B6	C7	C#7	D7	D#7	E7	F7	F#7	G7	G#7	A7	A#7	B7	C8
	D#2	E2	F3	F#3	G3	G#3	A3	A#3	B3	C3	C#3	D3	D#3	E3	F4	F#4	G4	G#4	A4	A#5	B4	C4

LOWER KEYBOARD



Octave Frequency of Audio Signal

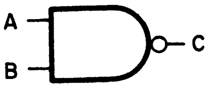
Voice Footage																						
8'	A2	A#2	B2	C3	C#3	D3	D#3	E3	F3	F#3	G3	G#3	A3	A#3	B3	C4	C#4	D4	D#4	E4	F4	F#4
	A1	A#1	B1	C1	C#1	D1	D#1	E1	F1	F#1	G1	G#1	A2	A#2	B2	C2	C#2	D2	D#2	E2	F2	F#2

Voice Footage																						
8'	G4	G#4	A4	A#4	B4	C5	C#5	D5	D#5	E5	F5	F#5	G5	G#5	A5	A#5	B5	C6	C#6	D6	D#6	E6
	G2	G#2	A3	A#3	B3	C3	C#3	D3	D#3	E3	F3	F#3	G3	G#3	A4	A#4	B4	C4	C#4	D4	D#4	E4

TRUTH TABLES

LOWREY PART NO.	MFG. PART NO.	FIG.
991-025515	CD4011	1
991-025516	CD4071	2
991-026022	CD4027	3
991-026025	CD4001	4
991-027358	CD4013	6

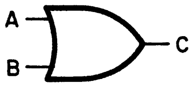
FIG. 1



NAND

A	B	C
0	0	1
0	1	1
1	0	1
1	1	0

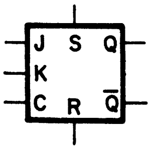
FIG. 2



OR

A	B	C
0	0	0
0	1	1
1	0	1
1	1	1

FIG. 3

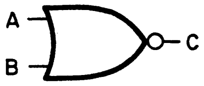


J-K FLIP-FLOP

T_n					T_n+1	
J	K	S	R	Clk	Q	$\overline{Q}$
1	0	0	0	↑	1	0
0	1	0	0	↑	0	1
0	0	0	0	↑	Q_n	$\overline{Q}_n$
1	1	0	0	↑	$\overline{Q}_n$	Q_n
X	X	0	1	X	0	1
X	X	1	0	X	1	0
X	X	1	1	X	1	1

X = Don't Care

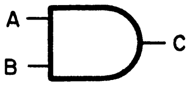
FIG. 4



NOR

A	B	C
0	0	1
0	1	0
1	0	0
1	1	0

FIG. 5

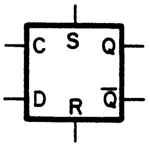


AND

A	B	C
0	0	0
0	1	0
1	0	0
1	1	1

(Reference only)

FIG. 6

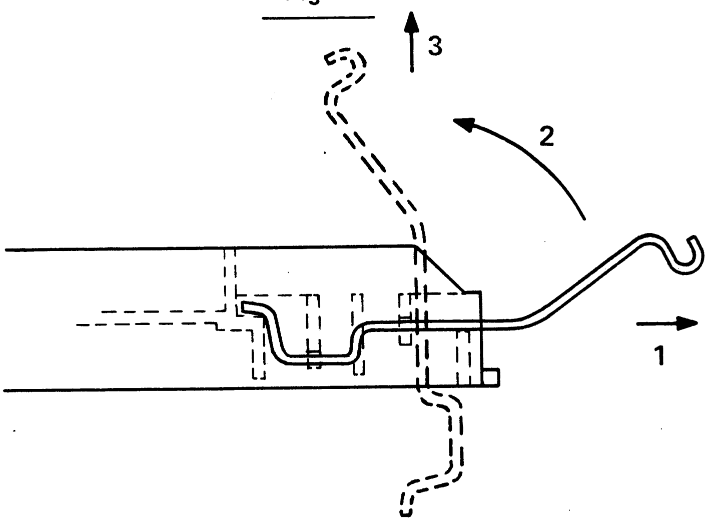


D FLIP-FLOP

T_n				T_n+1	
D	S	R	Clk	Q	$\overline{Q}$
1	0	0	↑	1	0
0	0	0	↑	0	1
X	0	1	X	0	1
X	1	0	X	1	0
X	1	1	X	1	1

WIRE KEYSWITCH ACTUATOR REPLACEMENT

Fig. 1

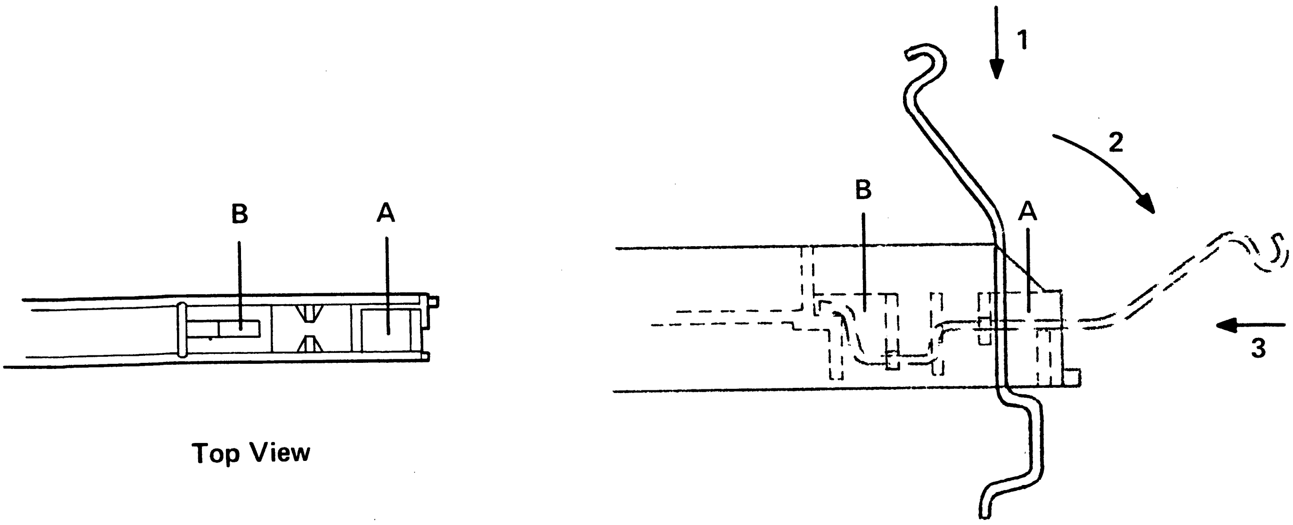


Side View

To remove wire actuator

1. Using pliers, pull wire actuator outward until it stops.
2. Rotate upward to a vertical position.
3. Lift wire actuator vertically from key.

Fig. 2



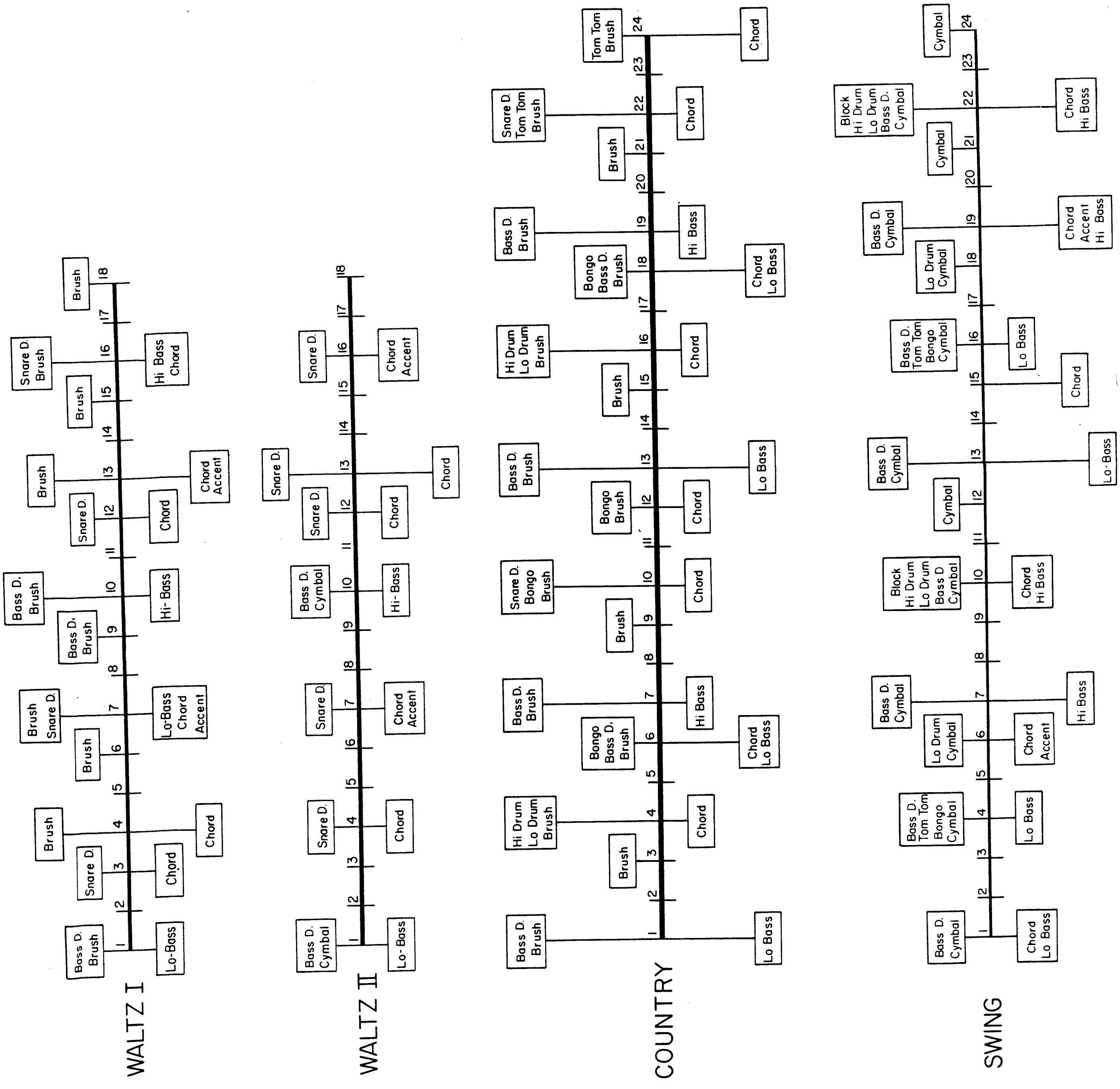
Top View

Side View

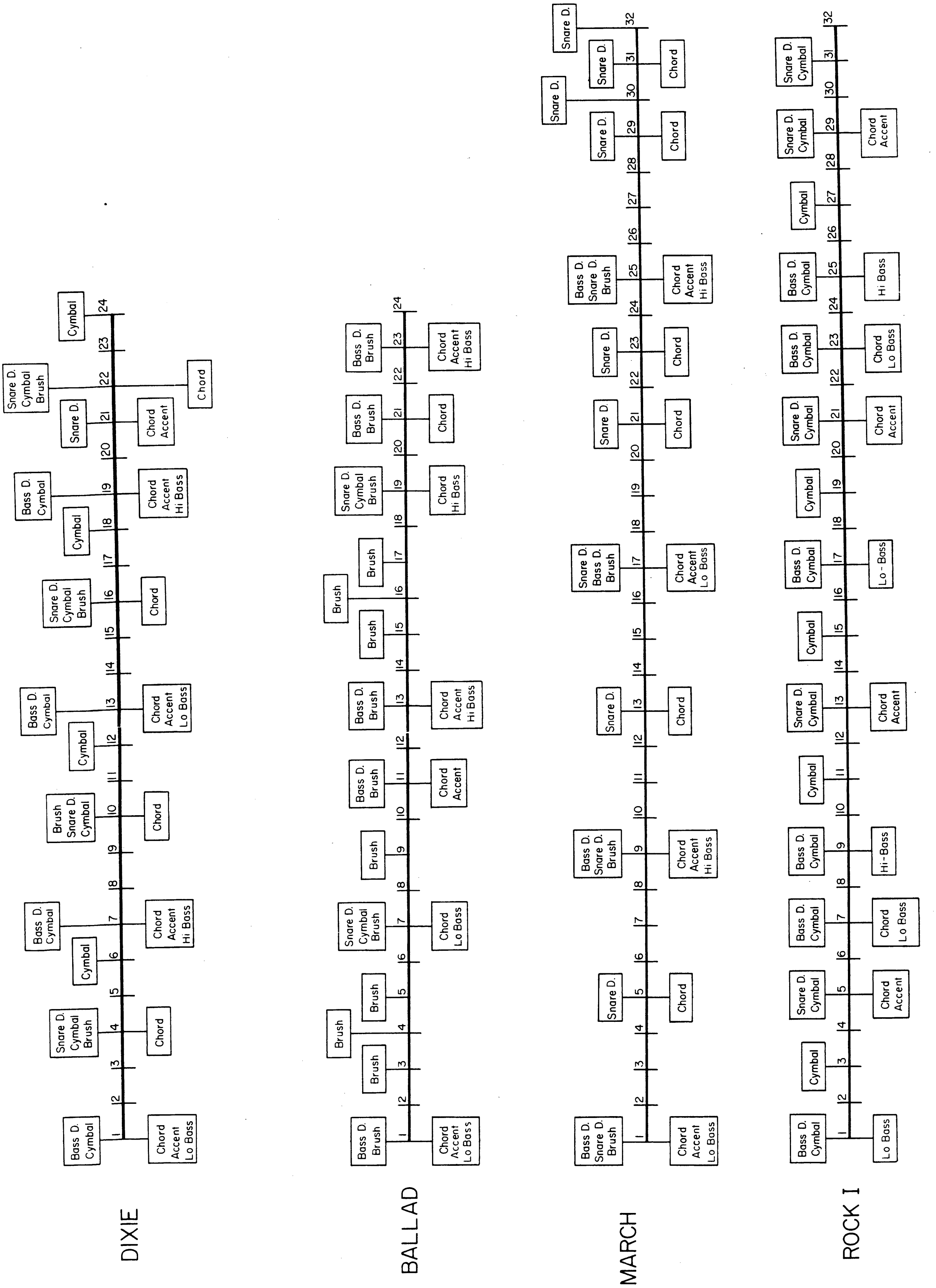
To replace wire actuator

1. Holding hooked end, insert wire actuator vertically into opening A.
2. Rotate downward so that straight end positions into Slot B.
3. Using pliers, push wire actuator inward until it stops.

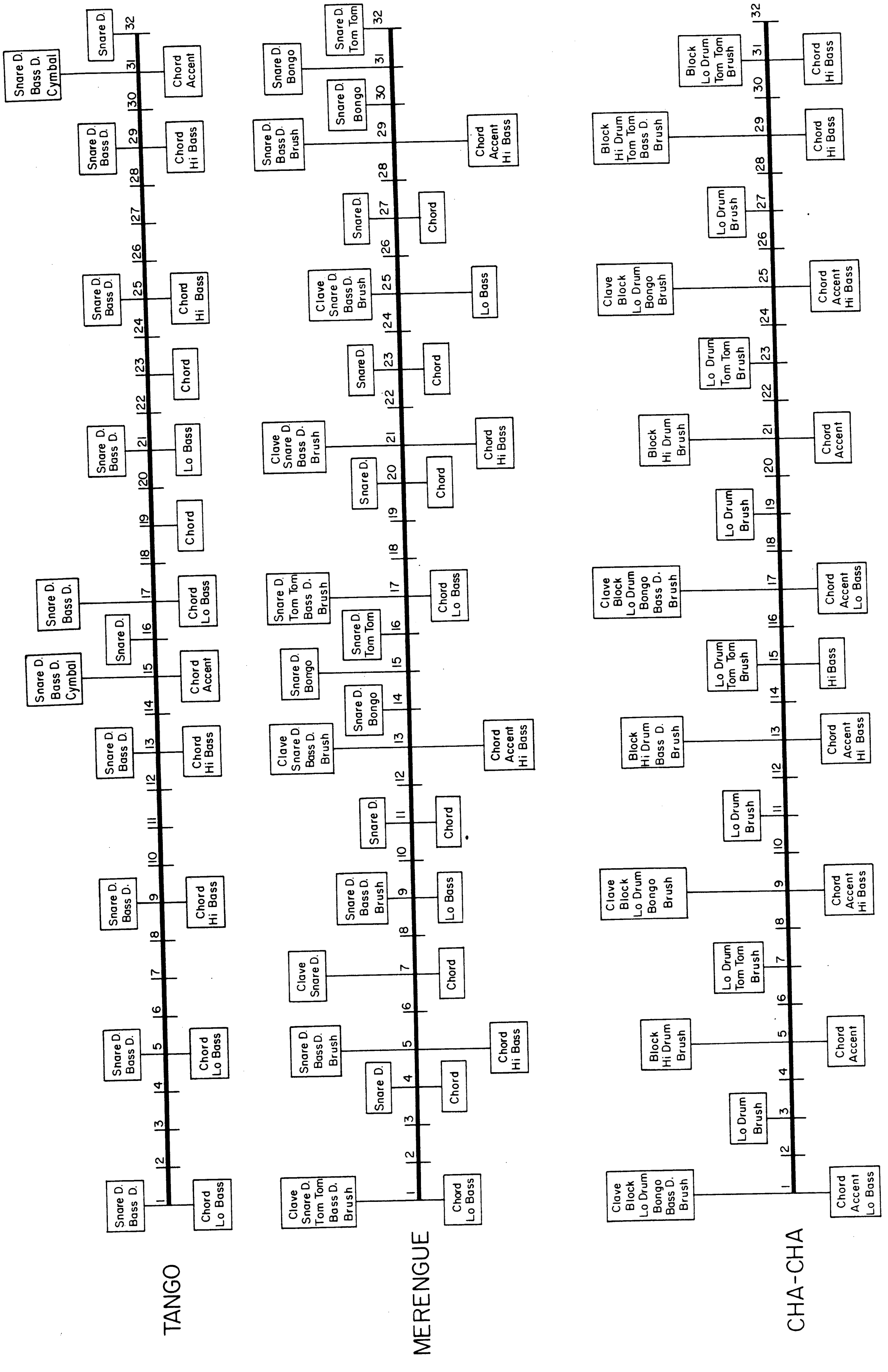
RHYTHM PATTERNS DIAGRAM


WALTZ I
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18
Bass D. Brush
Lo-Bass
Snare D
Chord
Brush
Chord
Brush
Brush Snare D.
Lo-Bass Chord Accent
Bass D. Brush
Bass D. Brush
Hi-Bass
Snare D.
Chord
Brush
Chord Accent
Brush
Snare D. Brush
Hi Bass Chord
Brush
WALTZ II
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18
Bass D. Cymbal
Lo-Bass
Snare D.
Chord
Snare D
Chord Accent
Bass D. Cymbal
Hi-Bass
Snare D
Chord
Snare D.
Chord
Snare D.
Chord Accent
COUNTRY
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
Bass D. Brush
Lo Bass
Brush
Hi Drum Lo Drum Brush
Chord
Bongo Bass D. Brush
Chord Lo Bass
Bass D. Brush
Hi Bass
Brush
Snare D. Bongo Brush
Chord
Bongo Brush
Chord
Bass D. Brush
Lo Bass
Brush
Hi Drum Lo Drum Brush
Chord
Bongo Bass D. Brush
Chord Lo Bass
Bass D. Brush
Hi Bass
Brush
Snare D. Tom Tom Brush
Chord
Tom Tom Brush
Chord
SWING
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
Bass D. Cymbal
Chord Lo Bass
Bass D. Tom Tom Bongo Cymbal
Lo Bass
Lo Drum Cymbal
Chord Accent
Bass D. Cymbal
Hi Bass
Block Hi Drum Lo Drum Bass D Cymbal
Chord Hi Bass
Cymbal
Bass D. Cymbal
Lo-Bass
Chord
Bass D. Tom Tom Bongo Cymbal
Lo Bass
Lo Drum Cymbal
Bass D. Cymbal
Chord Accent Hi Bass
Cymbal
Block Hi Drum Lo Drum Bass D. Cymbal
Chord Hi Bass
Cymbal

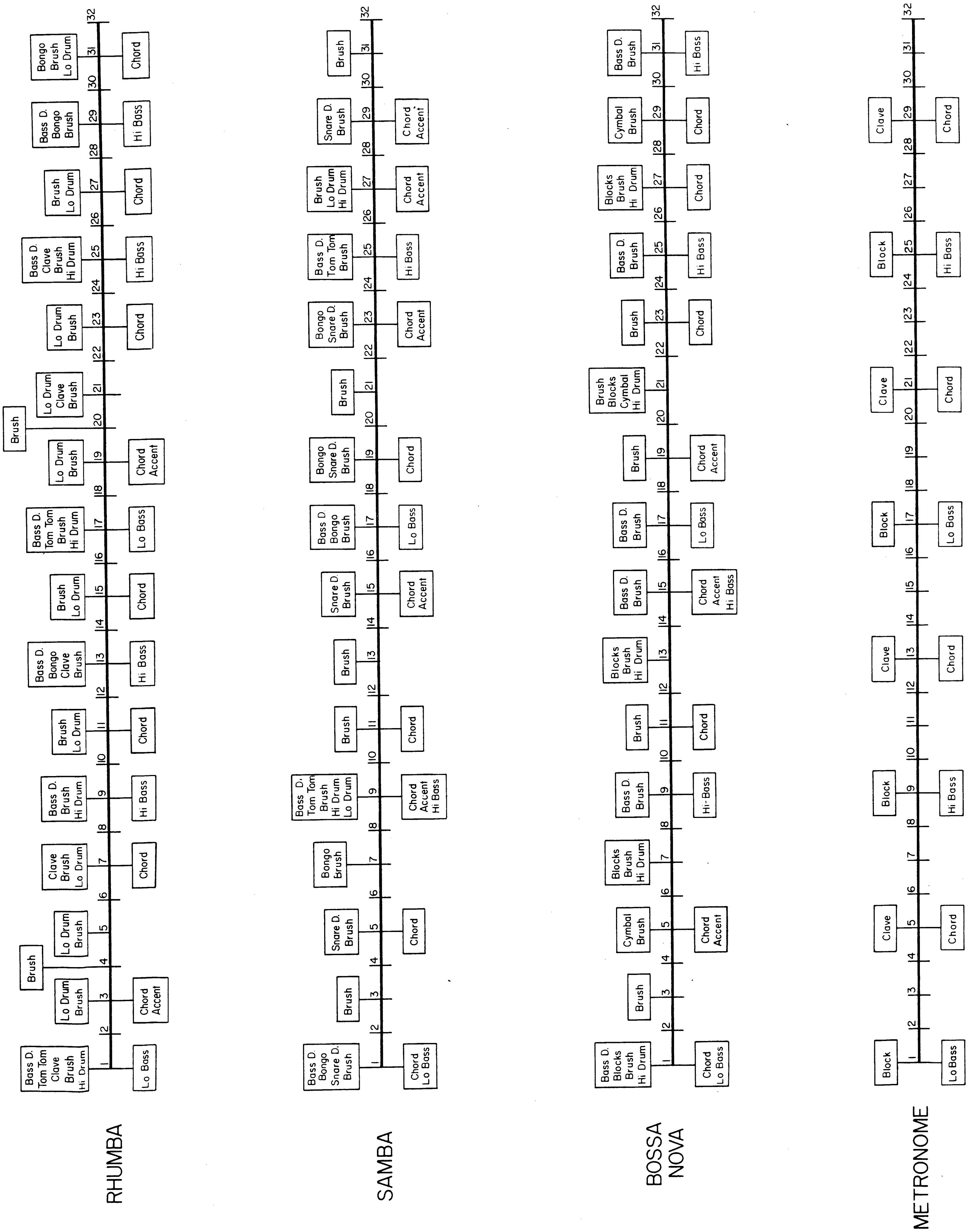
RHYTHM PATTERNS DIAGRAM


DIXIE
1
Bass D. Cymbal
Chord Accent Lo Bass
2
3
4
Snare D. Cymbal Brush
Chord
5
6
Cymbal
7
Bass D. Cymbal
Chord Accent Hi Bass
8
9
10
Brush Snare D. Cymbal
Chord
11
12
Cymbal
13
Bass D. Cymbal
Chord Accent Lo Bass
14
15
16
Snare D. Cymbal Brush
Chord
17
18
Cymbal
19
Bass D. Cymbal
Chord Accent Hi Bass
20
21
Snare D.
Chord Accent
22
Snare D. Cymbal Brush
Chord
23
24
Cymbal
BALLAD
1
Bass D. Brush
Chord Accent Lo Bass
2
3
Brush
4
Brush
5
Brush
6
7
Snare D. Cymbal Brush
Chord Lo Bass
8
9
Brush
10
11
Bass D. Brush
Chord Accent
12
13
Bass D. Brush
Chord Accent Hi Bass
14
15
Brush
16
Brush
17
Brush
18
19
Snare D. Cymbal Brush
Chord Hi Bass
20
21
Bass D. Brush
Chord
22
23
Bass D. Brush
Chord Accent Hi Bass
24
MARCH
1
Bass D. Snare D. Brush
Chord Accent Lo Bass
2
3
4
5
Snare D.
Chord
6
7
8
9
Bass D. Snare D. Brush
Chord Accent Hi Bass
10
11
12
13
Snare D.
Chord
14
15
16
17
Snare D. Bass D. Brush
Chord Accent Lo Bass
18
19
20
21
Snare D
Chord
22
23
Snare D.
Chord
24
25
Bass D. Snare D. Brush
Chord Accent Hi Bass
26
27
28
29
Snare D.
Chord
30
Snare D.
31
Snare D.
Chord
32
Snare D.
ROCK I
1
Bass D. Cymbal
Lo Bass
2
3
Cymbal
4
5
Snare D. Cymbal
Chord Accent
6
7
Bass D. Cymbal
Chord Lo Bass
8
9
Bass D. Cymbal
Hi-Bass
10
11
Cymbal
12
13
Snare D. Cymbal
Chord Accent
14
15
Cymbal
16
17
Bass D. Cymbal
Lo-Bass
18
19
Cymbal
20
21
Snare D. Cymbal
Chord Accent
22
23
Bass D. Cymbal
Chord Lo Bass
24
25
Bass D. Cymbal
Hi Bass
26
27
Cymbal
28
29
Snare D. Cymbal
Chord Accent
30
31
Snare D. Cymbal
32

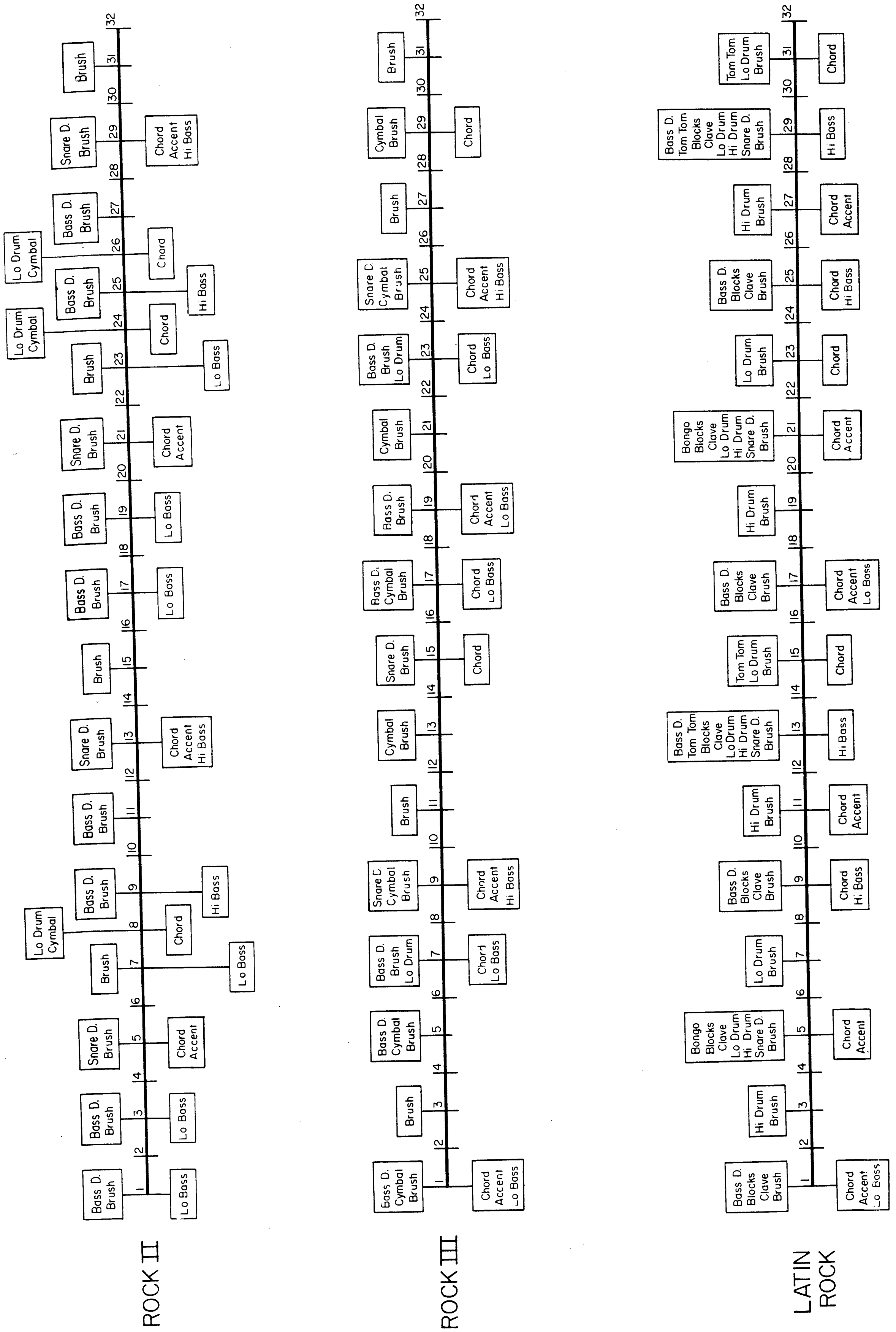
RHYTHM PATTERNS DIAGRAM


TANGO
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
Snare D. Bass D.
Chord Lo Bass
Snare D Bass D.
Chord Lo Bass
Snare D. Bass D.
Chord Hi Bass
Snare D Bass D.
Chord Hi Bass
Snare D. Bass D. Cymbal
Chord Accent
Snare D.
Snare D. Bass D.
Chord Lo Bass
Chord
Snare D. Bass D.
Lo Bass
Chord
Snare D. Bass D.
Chord Hi Bass
Snare D. Bass D.
Chord Hi Bass
Snare D. Bass D. Cymbal
Chord Accent
Snare D.
MERENGUE
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
Clave Snare D. Tom Tom Bass D. Brush
Chord Lo Bass
Snare D.
Chord
Snare D Bass D. Brush
Chord Hi Bass
Clave Snare D.
Chord
Snare D. Bass D. Brush
Lo Bass
Snare D.
Chord
Clave Snare D Bass D. Brush
Chord Accent Hi Bass
Snare D. Bongo
Snare D. Bongo
Snare D Tom Tom
Snare D. Tom Tom Bass D. Brush
Chord Lo Bass
Snare D.
Chord
Clave Snare D Bass D. Brush
Chord Hi Bass
Snare D.
Chord
Clave Snare D Bass D. Brush
Lo Bass
Snare D.
Chord
Snare D. Bass D. Brush
Chord Accent Hi Bass
Snare D. Bongo
Snare D. Bongo
Snare D. Tom Tom
CHA-CHA
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
Clave Block Lo Drum Bongo Bass D. Brush
Chord Accent Lo Bass
Lo Drum Brush
Block Hi Drum Brush
Chord Accent
Lo Drum Tom Tom Brush
Clave Block Lo Drum Bongo Brush
Chord Accent Hi Bass
Lo Drum Brush
Block Hi Drum Bass D. Brush
Chord Accent Hi Bass
Lo Drum Tom Tom Brush
Hi Bass
Clave Block Lo Drum Bongo Bass D. Brush
Chord Accent Lo Bass
Lo Drum Brush
Block Hi Drum Brush
Chord Accent
Lo Drum Tom Tom Brush
Clave Block Lo Drum Bongo Brush
Chord Accent Hi Bass
Lo Drum Brush
Block Hi Drum Tom Tom Bass D. Brush
Chord Hi Bass
Block Lo Drum Tom Tom Brush
Chord Hi Bass

RHYTHM PATTERNS DIAGRAM


RHUMBA
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
Bass D. Tom Tom Clave Brush Hi Drum
Lo Bass
Lo Drum Brush
Chord Accent
Brush
Lo Drum Brush
Clave Brush Lo Drum
Chord
Bass D. Brush Hi Drum
Hi Bass
Brush Lo Drum
Chord
Bass D. Bongo Clave Brush
Hi Bass
Brush Lo Drum
Chord
Bass D. Tom Tom Brush Hi Drum
Lo Bass
Lo Drum Brush
Chord Accent
Brush
Lo Drum Clave Brush
Lo Drum Brush
Chord
Bass D. Clave Brush Hi Drum
Hi Bass
Brush Lo Drum
Chord
Bass D. Bongo Brush
Hi Bass
Bongo Brush Lo Drum
Chord
SAMBA
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
Bass D. Bongo Snare D. Brush
Chord Lo Bass
Brush
Snare D. Brush
Chord
Bongo Brush
Bass D. Tom Tom Brush Hi Drum Lo Drum
Chord Accent Hi Bass
Brush
Chord
Brush
Snare D. Brush
Chord Accent
Bass D. Bongo Brush
Lo Bass
Bongo Snare D. Brush
Chord
Brush
Bongo Snare D. Brush
Chord Accent
Bass D. Tom Tom Brush
Hi Bass
Brush Lo Drum Hi Drum
Chord Accent
Snare D. Brush
Chord Accent
Brush
BOSSA NOVA
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
Bass D. Blocks Brush Hi Drum
Chord Lo Bass
Brush
Cymbal Brush
Chord Accent
Blocks Brush Hi Drum
Bass D. Brush
Hi-Bass
Brush
Chord
Blocks Brush Hi Drum
Bass D. Brush
Chord Accent Hi Bass
Bass D. Brush
Lo Bass
Brush
Chord Accent
Brush Blocks Cymbal Hi Drum
Brush
Chord
Bass D. Brush
Hi Bass
Blocks Brush Hi Drum
Chord
Cymbal Brush
Chord
Bass D. Brush
Hi Bass
METRONOME
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
Block
Lo Bass
Clave
Chord
Block
Hi Bass
Clave
Chord
Block
Lo Bass
Clave
Chord
Block
Hi Bass
Clave
Chord

RHYTHM PATTERNS DIAGRAM


ROCK II
1
Bass D. Brush
Lo Bass
2
3
Bass D. Brush
Lo Bass
4
5
Snare D. Brush
Chord Accent
6
7
Brush
Lo Bass
8
Lo Drum Cymbal
Chord
9
Bass D. Brush
Hi Bass
10
11
Bass D. Brush
12
13
Snare D. Brush
Chord Accent Hi Bass
14
15
Brush
16
17
Bass D. Brush
Lo Bass
18
19
Bass D. Brush
Lo Bass
20
21
Snare D. Brush
Chord Accent
22
23
Brush
Lo Bass
24
Lo Drum Cymbal
Chord
25
Bass D. Brush
Hi Bass
26
Lo Drum Cymbal
Chord
27
Bass D. Brush
28
29
Snare D. Brush
Chord Accent Hi Bass
30
31
Brush
32
ROCK III
1
Bass D. Cymbal Brush
Chord Accent Lo Bass
2
3
Brush
4
5
Bass D. Cymbal Brush
6
7
Bass D. Brush Lo Drum
Chord Lo Bass
8
9
Snare D. Cymbal Brush
Chord Accent Hi Bass
10
11
Brush
12
13
Cymbal Brush
14
15
Snare D. Brush
Chord
16
17
Bass D. Cymbal Brush
Chord Lo Bass
18
19
Bass D. Brush
Chord Accent Lo Bass
20
21
Cymbal Brush
22
23
Bass D. Brush Lo Drum
Chord Lo Bass
24
25
Snare D. Cymbal Brush
Chord Accent Hi Bass
26
27
Brush
28
29
Cymbal Brush
Chord
30
31
Brush
32
LATIN ROCK
1
Bass D. Blocks Clave Brush
Chord Accent Lo Bass
2
3
Hi Drum Brush
4
5
Bongo Blocks Clave Lo Drum Hi Drum Snare D. Brush
Chord Accent
6
7
Lo Drum Brush
8
9
Bass D. Blocks Clave Brush
Chord Hi Bass
10
11
Hi Drum Brush
Chord Accent
12
13
Bass D. Tom Tom Blocks Clave Lo Drum Hi Drum Snare D. Brush
Hi Bass
14
15
Tom Tom Lo Drum Brush
Chord
16
17
Bass D. Blocks Clave Brush
Chord Accent Lo Bass
18
19
Hi Drum Brush
20
21
Bongo Blocks Clave Lo Drum Hi Drum Snare D. Brush
Chord Accent
22
23
Lo Drum Brush
Chord
24
25
Bass D. Blocks Clave Brush
Chord Hi Bass
26
27
Hi Drum Brush
Chord Accent
28
29
Bass D. Tom Tom Blocks Clave Lo Drum Hi Drum Snare D. Brush
Hi Bass
30
31
Tom Tom Lo Drum Brush
Chord
32

PARTS INFORMATION

STANDARD PARTS

Replacements for all standard electronic parts and hardware may be purchased directly from local suppliers generally in less time than would be required to obtain them from the factory.

SPECIAL PARTS

In addition to the standard replacement parts, special electronic and mechanical parts are also used. These parts are manufactured by and to the specifications of the factory. Order these parts directly from the factory since they would be difficult or impossible to obtain from other sources.

PARTS ORDERING INFORMATION

When ordering parts be sure to include the following information:

1. Model and Serial Number
2. Part Number
3. A description of the part
4. Specify how you want the part shipped.

Most special electronic parts and mechanical parts will have a part number stamped on them. In the event that the part number is missing, or you are unable to read the part number, a complete description of the part and where it is used will allow the factory to fill your parts order. When parts are ordered in the proper manner the factory is able to fill your orders promptly—delays that might result are avoided.

ADDRESS PARTS ORDERS TO:

LOWREY ELECTRONICS PARTS DEPARTMENT
4400 W. 45th Street
Chicago, Illinois 60632

IMPORTANT

IN ANY CORRESPONDENCE CONCERNING THIS INSTRUMENT ALWAYS INCLUDE MODEL AND SERIAL NUMBERS

PARTS LIST

TABLE OF CONTENTS

Amplifier/Power Supply/Expression Pedal Assembly 45

Bass Pedal Assembly 46

Bench Assembly 46

Chord Function Generator Board Assembly 46

Chorus Board Assembly 46

Console Assembly 47

Leslie Tremolo Unit 47

Percussion & Upper/Lower Keying Board Assembly 47

Quality Control Board Assembly 48

Rhythm Board Assembly 48

Tab Panel Assembly 49

Tone Generator & Pedal Board Assembly 50

Upper Keyboard Flute Groups & Filter Board Assembly 51

Upper, Lower Keyswitch Assembly 51

THE PARTS LIST CONTAINS THE FOLLOWING INFORMATION:

1. Name of Part
2. Value, Tolerance and Code (When Important)
3. Brief description
4. Where the part is found (assembly, printed circuit board, etc.)
5. Schematic Reference Number
6. PART NUMBER — USE IT!

This parts list includes all standard stock replacement parts. No attempt has been made to include every nut, bolt and screw. If the necessity for a non-listed part arises, please write describing the parts location and function as well as model and serial number of the unit.

PARTS LIST

AMPLIFIER/POWER SUPPLY/EXPRESSION PEDAL ASSEMBLY

Part	Description	Schematic Reference	Part Number
Arm	Actuator		967-015934
Assembly	Control Arm		997-016060
Assembly	Glide Switch		997-025104
Assembly	Pedal & Glide Switch		997-026127
Assembly	Pedal & Mat		997-023127
Assembly	Power Supply		997-025334
Bulb	GE1819		939-003190
Capacitor	Electrolytic 15 UF 6V		945-008895-079
Capacitor	Electrolytic 6000 UF 40V		945-025571
Capacitor	Electrolytic 3000 40V 1500x3 30VC Neg		945-022770
Capacitor	Electrolytic 1000-1000 40V NP		945-022771
Capacitor	Electrolytic 1 UF 35V NP		945-008895-015
Capacitor	Electrolytic 350 UF 25V		945-008895-084
Capacitor	Electrolytic 15 UF 6V		945-008895-079
Capacitor	Electrolytic 1000 UF 30V		945-008895-049
Capacitor	Electrolytic 6 UF 20V		945-008895-007
Capacitor	Electrolytic 1 UF 25V		945-008895-041
Capacitor	Polystyrene .0068 UF 10% 50V		946-026037-682
Cord	Power		989-008717
Diffuser	White		922-015938-001
Diode	Triple	D166	919-010454-001
Diode	Rectifier Bridge 6 Amps	D170	919-022736-003
Diode	Zener 5.1V	Z2	919-017406-022
Diode	Zener 10V	Z3, 4	919-017406-057
Diode	Zener 14V 5%	Z5	919-017406-065
Diode	Zener 24V	Z1	919-017406-061
Diode		D165, 171, 172	919-010623
Fuse	2-Amp Pigtail		939-001120-003
IC	+15V Regulator	IC50	992-024149-009
Light	Shield		922-015937-001
Mat	Glide Switch		959-009208-003
Mat	Glide Switch		959-009208-004
Resistor	WW .51 Ohm 10% 5W		924-008896
Resistor	WW .18 Ohm 10% 2W		924-008896-021
Resistor	WW 82 Ohm 10% 2W		924-010471-820
Resistor	Fusible .82 Ohm 2W		924-024557-001
Resistor	WW 27 Ohm 10% 2W		924-008896-040
Resistor	WW 220 Ohm 10% 2W		924-010471-221
Resistor	WW 330 Ohm 10% 2W		924-010471-331
Socket	Transistor		906-021455
Spring	Compression		975-011747-001
Spring	Contact		917-027316
Transformer	Power	T1	954-022772
Transistor	NPN Output	Q115, 116	992-022201
Transistor	PNP Regulator	Q104	992-022773
Transistor	PNP Preamps	Q113, 114	991-013544
Transistor	PNP Pre-driver	Q112	991-015614
Transistor	NPN Driver	Q110	991-020425-003
Transistor	PNP Driver	Q111	991-020426-003
Transistor	Darlington	Q120	992-028217

PARTS LIST

BASS PEDAL ASSEMBLY

Part	Description	Schematic Reference	Part Number
Assembly	Long Pedal		997-006405
Assembly	Short Pedal		997-006406
Cap	Black (Short Pedal)		915-003863
Cap	Dark Brown (Long Pedal)		915-003856
Spring	Compression		975-005811
Spring	Contact		917-009155

BENCH ASSEMBLY

Part	Description	Schematic Reference	Part Number
Bench	Transitional Walnut		978-025256

CHORD FUNCTION GENERATOR BOARD ASSEMBLY

Part	Description	Schematic Reference	Part Number
Capacitor	Electrolytic 6 UF 20V		945-019366-001
Capacitor	Electrolytic 25 UF 25V	C11	945-015384-001
Capacitor	Electrolytic 2x2 UF 30V Dual		945-024186
Capacitor	Electrolytic 1 UF 20V		945-019366-004
Capacitor	Metal Polyester .022 UF 5% 50V		946-026745-223
Capacitor	Metal Polyester .0039 UF 5% 50V		946-026745-392
Capacitor	Metal Polyester .047 UF 5% 50V		946-026745-473
Capacitor	Polystyrene .01 UF 10% 50V		946-026037-103
Capacitor	Polystyrene .1 UF 10% 50V		946-026037-104
Capacitor	Polystyrene 560 PF 5% 63V		946-024767-002
Capacitor	Polystyrene .22 UF 10% 50V		946-026037-224
Capacitor	Tantalum 5.6 UF 25V		946-021452-001
Coil	Oscillator 600 uh Chord Tuning Adjustment	L15	952-018874-005
Diode		All others	919-024769
Diode		D108	919-024117
Diode		D88	919-004799
Diode		D83	919-010873
IC	Quad Dual Input NOR Gate	IC25	991-026025
IC	Chord Function Generator	IC26	991-026003
IC	Dual Op-Amp Magic Chord Flute Filter	IC27	991-025244
Network	23-Pin		949-024737
Potentiometer	10K 20% Chord Level Adjustment	VR13	925-004349-003
Socket	IC 8-Pin		906-021448
Socket	14-Pin		906-018905
Socket	40-Pin		906-022727
Transistor	NPN Preamps	Q81, 82, 84	991-002298
Transistor	NPN Flute Emitter Follower	Q83	991-026315
Transistor	NPN Master Oscillator	Q80	991-025535
Transistor	Darlington, Keyed Arpeggio Driver	Q85	991-016727

CHORUS BOARD ASSEMBLY

Part	Description	Schematic Reference	Part Number
Capacitor	Electrolytic 1 UF +50 -10% 50V NP		945-016692
Capacitor	Electrolytic 100 UF 35V	C6, 8, 20, 21	945-026783-007
Capacitor	Electrolytic 2 UF 25V		945-015619
Capacitor	Metal Polyester .001 UF 5% 50V		946-026745-102
Capacitor	Metal Polyester .0022 UF 5% 50V		946-026745-222
Capacitor	Metal Polyester .22 UF 5% 50V		946-026745-224

PARTS LIST

CHORUS BOARD ASSEMBLY (Continued)

Part	Description	Schematic Reference	Part Number
Capacitor	Metal Polyester .82 UF 20% 50V		946-026795-824
Capacitor	Polystyrene .01 UF 10% 50V		946-026037-103
Capacitor	Polystyrene .22 UF 10% 50V		946-026037-224
Capacitor	Polystyrene .047 UF 10% 50V		946-026037-473
Diode		D45-50	919-024769
IC	Bucket Brigade	IC20	991-020077-001
IC	Dual Op-Amp Low-Pass Filter	IC21	991-025244
Potentiometer	50K 20% Bias Adjustment	VR10	925-004349-007
Potentiometer	1M 20% Speed Adjustment	VR11	925-004349-004
Resistor	WW 180 Ohm 10% 2W	R6	924-010471-181
Socket	IC 8-Pin		906-021448
Transistor	NPN Voltage-Controlled Oscillator	Q77, 78	991-026315

CONSOLE ASSEMBLY

Part	Description	Schematic Reference	Part Number
Endblock	Lower Left-hand - Walnut		978-026082-008
Endblock	Lower Right-hand - Walnut		978-026083-008
Endblock	Upper Left-hand - Walnut		978-026084-008
Endblock	Upper Right-hand - Walnut		978-026085-008
Speaker	8-inch		985-002185-003
Speaker	12-inch		985-021082

LESLIE TREMOLO UNIT

Part	Description	Schematic Reference	Part Number
Assembly	Motor and Bracket		019638
Assembly	Motor and Pulley		019661
Belt			021048
Bushing	Black Rubber		019463
Drum	Styrene		019794
Shaft	Rotor and Pulley		019745
Speaker	8-inch 8-ohm		010207

PERCUSSION & UPPER/LOWER KEYING BOARD ASSEMBLY

Part	Description	Schematic Reference	Part Number
Capacitor	Crossover 50 UF 20V		945-022780
Capacitor	Crossover 35 UF 20V		945-022269
Capacitor	Electrolytic 25 UF 25V	C3	945-008895-008
Capacitor	Electrolytic 10 UF 20V		945-008895-009
Capacitor	Electrolytic 1 UF 20V		945-008895-011
Capacitor	Electrolytic 2x30 UF 25V Dual		945-022781
Capacitor	Tantalum 5.6 UF 25V		946-021452-001
Capacitor	Tantalum 1.0 UF 35V		946-021452-002
Diode		D6-18, 32-34, 38, 39	919-024769
Transistor	PNP Wow Reset	Q69	991-010098
Transistor	NPN Sustain Cancel, Wow Keyer & Shaper	Q64, 66, 68	991-002232
Transistor	NPN Vibrato Delay Trigger	Q67	991-008393
Transistor	Darlington Slow Attack & Percuss. Modulator Drivers, Detector	Q63, 73, 74	991-016727
Transistor	PNP Sustain Regulator & Detector	Q62, 65	991-020426-001

PARTS LIST

QUALITY CONTROL BOARD ASSEMBLY

Part	Description	Schematic Reference	Part Number
Capacitor	Electrolytic 200 UF 25V	C16	945-008895
Capacitor	Electrolytic 10 UF 20V		945-008895-009
Capacitor	Electrolytic 1 UF 20V		945-008895-011
Capacitor	Electrolytic 50 UF 20V		945-008895-012
Capacitor	Electrolytic 1 UF 35V NP		945-008895-015
Capacitor	Electrolytic 4 UF 35V NP		945-008895-016
Capacitor	Electrolytic 500 UF 18V	C5	945-008895-080
Capacitor	Tantalum 5.6 UF 25V		945-021452-001
Coil	Toroid 10 H String Bass Voicing	L10	952-021447-002
Coil	Toroid 500 MH Banjo & Wow Voicing	L5, 13	952-021447-008
Coil	Toroid 1 H Horn Voicing	L6.	952-021447-009
IC	Op-Amp Percussion & Accompaniment Mod.	IC14, 16	991-021444-001
Photocell	Auto Wow	P3.	948-022248
Potentiometer	50K 20% Percuss. & Accomp. Thump Adjust.	VR4, 7	925-004349-007
Socket	IC 8-Pin		906-021448
Transistor	NPN Collector Amps & Preamps	Q6, 15, 27-30, 33, 35-38, 42, 59, 71, 72, 86	991-002298
Transistor	NPN Lower Keyboard Bass Killer	Q58	991-002232
Transistor	NPN String Bass Preamp	Q60	991-008393
Transistor	NPN Banjo Preamp, LED Driver	Q34, 70	991-018238

RHYTHM BOARD ASSEMBLY

Part	Description	Schematic Reference	Part Number
Capacitor	Electrolytic 100 UF 16V	C10, 17.	945-026783-006
Capacitor	Electrolytic 1 UF 20V		945-019366-004
Capacitor	Electrolytic 2 UF 25V		945-015619
Capacitor	Metal Polyester .1 UF 5% 50V		946-026745-104
Capacitor	Metal Polyester .0018 UF 5% 50V		946-026745-182
Capacitor	Metal Polyester .0022 UF 5% 50V		946-026745-222
Capacitor	Metal Polyester .0039 UF 5% 50V		946-026745-392
Capacitor	Metal Polyester .0056 UF 5% 50V		946-026745-562
Capacitor	Metal Polyester .1 UF 5% 50V		946-026784-104
Capacitor	Metal Polypropylene .033 UF 5% 50V		946-026784-333
Capacitor	Metal Polypropylene .039 UF 5% 50V		946-026784-393
Capacitor	Metal Polypropylene .068 UF 5% 50V		946-026784-683
Capacitor	Polypropylene .0051 UF 2.5% 50V		946-027302-512
Capacitor	Polypropylene .01 UF 2.5% 50V		946-027302-103
Capacitor	Polystyrene .001 UF 10% 50V		946-026037-102
Capacitor	Polystyrene .01 UF 10% 50V		946-026037-103
Capacitor	Polystyrene .015 UF 10% 50V		946-026037-153
Capacitor	Polystyrene .15 UF 10% 50V		946-026037-154
Capacitor	Polystyrene .0022 UF 10% 50V		946-026037-222
Capacitor	Polystyrene .022 UF 10% 50V		946-026037-223
Capacitor	Polystyrene .22 UF 10% 50V		946-026037-224
Capacitor	Polystyrene .27 UF 10% 50V		946-026037-274
Capacitor	Polystyrene .033 UF 10% 50V		946-026037-333
Capacitor	Polystyrene .047 UF 10% 50V		946-026037-473
Capacitor	Polystyrene .068 UF 10% 50V		946-026037-683
Capacitor	Polystyrene .0082 UF 10% 50V		946-026037-822
Capacitor	Tantalum 1.0 UF 35V.		946-021452-002
Coil	70 MH		956-018877

PARTS LIST

Part	Description	Schematic Reference	Part Number
RHYTHM BOARD ASSEMBLY (Continued)			
Diode		All others	919-024769
Diode		D149, 151, 152	919-010873
IC	Hex Schmitt Trigger	IC34	991-025576
IC	Quad Dual Input OR Gate	IC43	991-025516
IC	Dual D Flip-Flop	IC37, 40, 44	991-027358
IC	Rhythm Function Generator	IC30	991-026389
IC	Quad Op-Amp	IC38, 41, 45	991-022794
IC	Digital Noise Generator	IC31	991-024108
IC	Quad Dual Input NAND Gate	IC42	991-025515
IC	Dual J-K Flip Flop	IC39	991-026022
IC	Dual 2 Wide 2 Input AND/OR Invert Gate	IC33, 35, 36	991-026613
Socket	IC 8-Pin		906-021448
Socket	14-Pin		906-018905
Socket	16-Pin		906-018905-001
Socket	28-Pin		906-018905-003
Transistor	NPN	Q90, 94-106	991-026315
Transistor	PNP	Q91, 92, 107	991-010098
TAB PANEL ASSEMBLY			
Capacitor	Electrolytic 8 UF 35V NP		945-008895-014
Guide	Slider		976-005170
Jack	Headphone		910-016688
Jack	Headphone		910-013556-008
Knob	Blue Variegated		915-026335-003
Knob	Green Variegated		915-026335-005
Knob	White Pearl		915-026335-001
Potentiometer	10K Rhythm Volume Control	VR16	925-021442-012
Potentiometer	1M Rhythm Speed Control	VR15	925-021442-010
Potentiometer	10K Lower Flute Volume Control	VR6	925-021442-007
Potentiometer	100K Custom Sustain Control	VR3	925-021442-006
Pusher	Long		964-025559
Pusher	Medium		964-001901
Pusher	Short		964-001903-002
Resistor	WW 150 Ohm 10% 2W		924-010471-151
Spring	Contact		917-005166-001
Spring	Toggle		975-026043
Spring	Toggle		975-002338-001
Switch	Leslie On/Off		960-010669-001
Switch	Chorus On/Off		960-010669-004
Switch	Power On/Off		960-010669
Switch	Rhythm Track Select		960-027322
Tab	Accordion		915-009876-296
Tab	Auto Wow		915-009876-298
Tab	Banjo		915-009876-272
Tab	Bass Full		915-009876-287
Tab	Bass Soft Medium		915-009876-299
Tab	Boogie Woogie Bass		915-009876-340
Tab	Cello 16		915-009876-243
Tab	Flute 16		915-009876-218
Tab	Flute 8		915-009876-219
Tab	Flute 4		915-009876-246

PARTS LIST

Part	Description	Schematic Reference	Part Number
TAB PANEL ASSEMBLY (Continued)			
Tab	Genie Voices Normal Organ		915-009876-297
Tab	Guitar		915-009876-324
Tab	Guitar Bass		915-009876-276
Tab	Guitar Strum		915-009876-331
Tab	Harmonic Flute		915-009876-309
Tab	Harmonica		915-009876-311
Tab	Harpsichord		915-009876-278
Tab	Harpsichord Arpeggio		915-009876-335
Tab	Hawaiian Guitar		915-009876-271
Tab	Keyed Arpeggio		915-009876-412
Tab	Lower Full		915-009876-260
Tab	Lower Soft Medium		915-009876-259
Tab	Magic Genie Chords		915-009876-409
Tab	Magic Genie Chords On		915-009876-329
Tab	Mandolin		915-009876-279
Tab	Oboe 16		915-009876-306
Tab	Pedal String Bass/Guitar Bass		915-009876-301
Tab	Pedal Sustain Off/On		915-009876-249
Tab	Piano		915-009876-282
Tab	Piano Arpeggio		915-009876-330
Tab	Piccolo		915-009876-310
Tab	Repeat Perc/Solo Perc		915-009876-300
Tab	Rhythm 1		915-009876-401
Tab	Rhythm 2		915-009876-402
Tab	Rhythm 3		915-009876-403
Tab	Rhythm 4		915-009876-404
Tab	Rhythm 5		915-009876-405
Tab	Rhythm 6		915-009876-406
Tab	Rhythm Start Normal/Auto		915-009876-293
Tab	String Bass		915-009876-284
Tab	Strum Slow Pick		915-009876-411
Tab	Trombone 16		915-009876-233
Tab	Ukulele Strum		915-009876-339
Tab	Vibes		915-009876-308
Tab	Vibra Harp		915-009876-285
Tab	Vibrato Off/On		915-009876-119
Tab	Violin		915-009876-307
TONE GENERATOR & PEDAL BOARD ASSEMBLY			
Capacitor	Electrolytic 4 UF 20V		945-002333
Capacitor	Electrolytic 25 UF 25V	C2	945-008895-008
Capacitor	Electrolytic 1 UF 20V		945-008895-011
Capacitor	Poly Epoxy 220 pf 2.5% 63V		946-024767-006
Capacitor	Tantalum .22 UF 20% 35V		946-012624-224
Capacitor	Tantalum 5.6 UF 25V	C15	946-021452-001
Capacitor	Tantalum 8.2 UF 20% 25V		946-021452-004
Capacitor	Tantalum 10 UF 20% 35V	C12	946-021452-005
Coil	70 uh	L1	956-018877
Coil	74 uh	L2	952-018874-003
Diode	Glide	D1	919-024117
Diode	Low Capacity	D2	919-010873

PARTS LIST

Part	Description	Schematic Reference	Part Number
TONE GENERATOR & PEDAL BOARD ASSEMBLY (Continued)			
Diode	Keying	D3, 4, 22, 30	919-024769
IC	TOS	IC1	991-018813-001
IC	TOS	IC2	991-018813-002
IC	6-stage Divider	IC3-12	991-021331-002
Potentiometer	100K 20% Vibrato Speed Adjustment	VR1	925-004349-010
Potentiometer	250K 20% Harmonica Adjustment	VR2	925-004349-002
Socket	14-Pin		906-018905
Transistor	NPN Master Oscillator	Q4	991-026695
Transistor	NPN Pedal Cancel Trigger	Q48	991-002232
Transistor	NPN Vibrato Oscillator & Pedal Cancel Trigger	Q2, 47	991-008393
Transistor	NPN Vibrato Delay Switcher	Q1	991-013544
Transistor	Darlington, Oscillator Amplifier Keyer	Q3, 50, 51, 53	991-016727
Transistor	PNP Pedal Keyer	Q49	991-010098
UPPER KEYBOARD FLUTE GROUPS & FILTER BOARD ASSEMBLY			
Capacitor	Electrolytic 6 UF 20V		945-008895-007
Capacitor	Electrolytic 25 UF 25V	C14	945-008895-008
Capacitor	Electrolytic 10 UF 20V		945-008895-009
Capacitor	Electrolytic 1 UF 20V		945-008895-011
Capacitor	Electrolytic 500 UF 18V	C4	945-008895-080
Capacitor	Tantalum 5.6 UF 25V		946-021452-001
Capacitor	Tantalum 1.0 UF 35V		946-021452-002
Coil	70 uh	L3	956-018877
Diode		D35-37	919-024769
Network	Keying 8-Pin		949-022778
Network	Keying 14-Pin		949-022779
Photocell	Tremolo	P1	948-022782
Transistor	NPN Collector Amps	Q7,9,10,11,13,14,16, 20-22	991-008393
Transistor	NPN Driver	Q17	991-018238
Transistor	FET Flute Switcher	Q8, 12, 23	991-022774
Transistor	Darlington	Q40	991-026617
UPPER, LOWER KEYSWITCH ASSEMBLY			
Actuator	Keyswitch		964-024116-001
Diode		D55-82	919-024769
Coil	70 uh	L12, 16	956-018877
Key	Black		964-024757
Key	White A		964-028228-001
Key	White B		964-028228-002
Key	White C		964-028228-003
Key	White D		964-028228-004
Key	White E		964-028228-005
Key	White F		964-028228-006
Key	White G		964-028228-007
Key	White AA		964-028228-008
Key	White CF		964-028228-009
Spring	Pulldown		975-027466
Wire	Actuator		976-025509

NOTE: Keys are supplied without wire actuators. Insert wire actuator from original Key into replacement key. If new actuators are needed, they should be ordered separately.

PHANTOM VIEWS & PHOTOGRAPHS

Vibrato, Master Oscillator Dividers & Pedal Board 2

Percussion & Upper, Lower Keying Board 4

Quality Control Board 6

Upper Keyboard Flute Groups & Filter Board 8

Lower Keyswitch Board 10

Rhythm Board 12

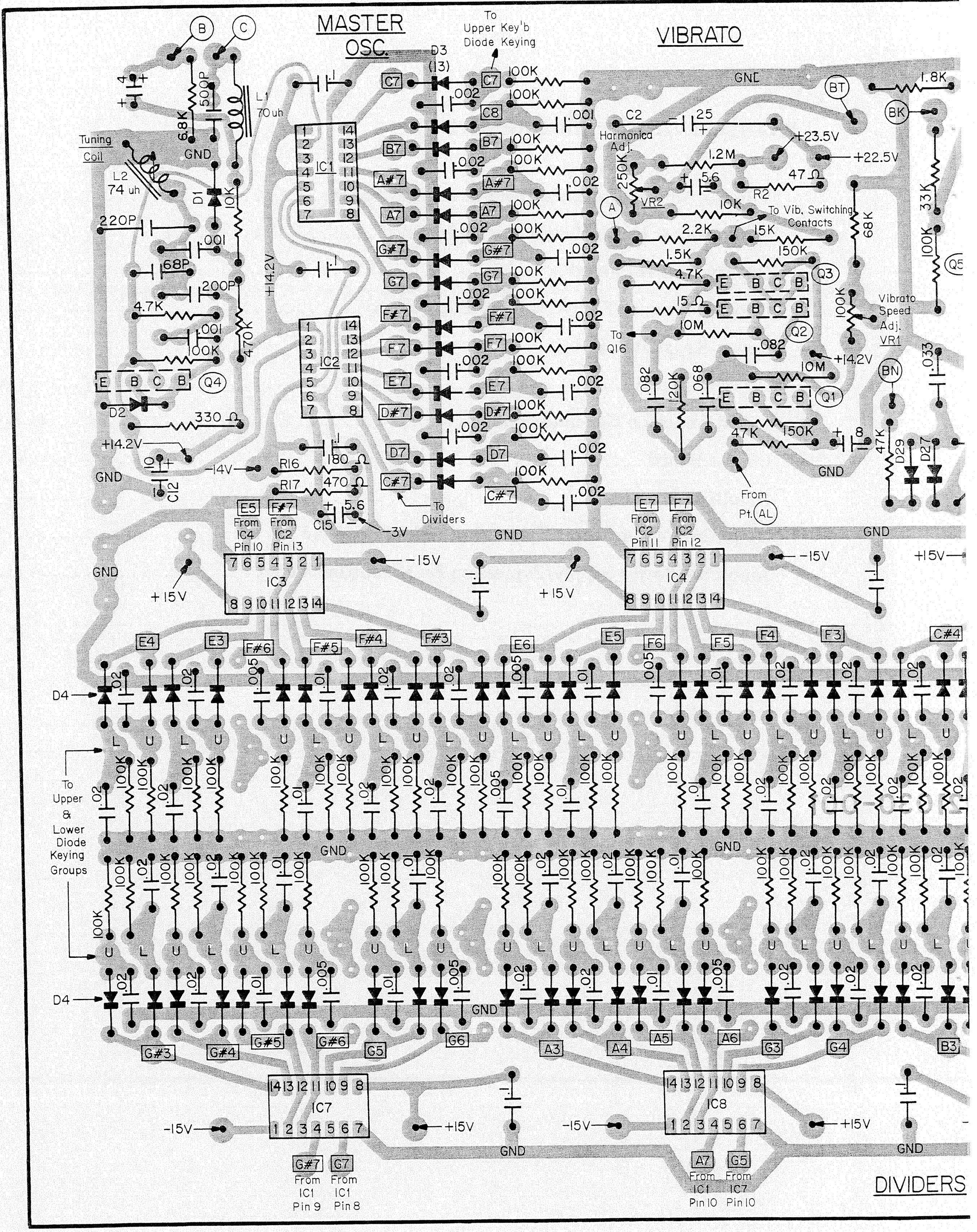
Chord Function Generator Board 14

Chorus Board 15

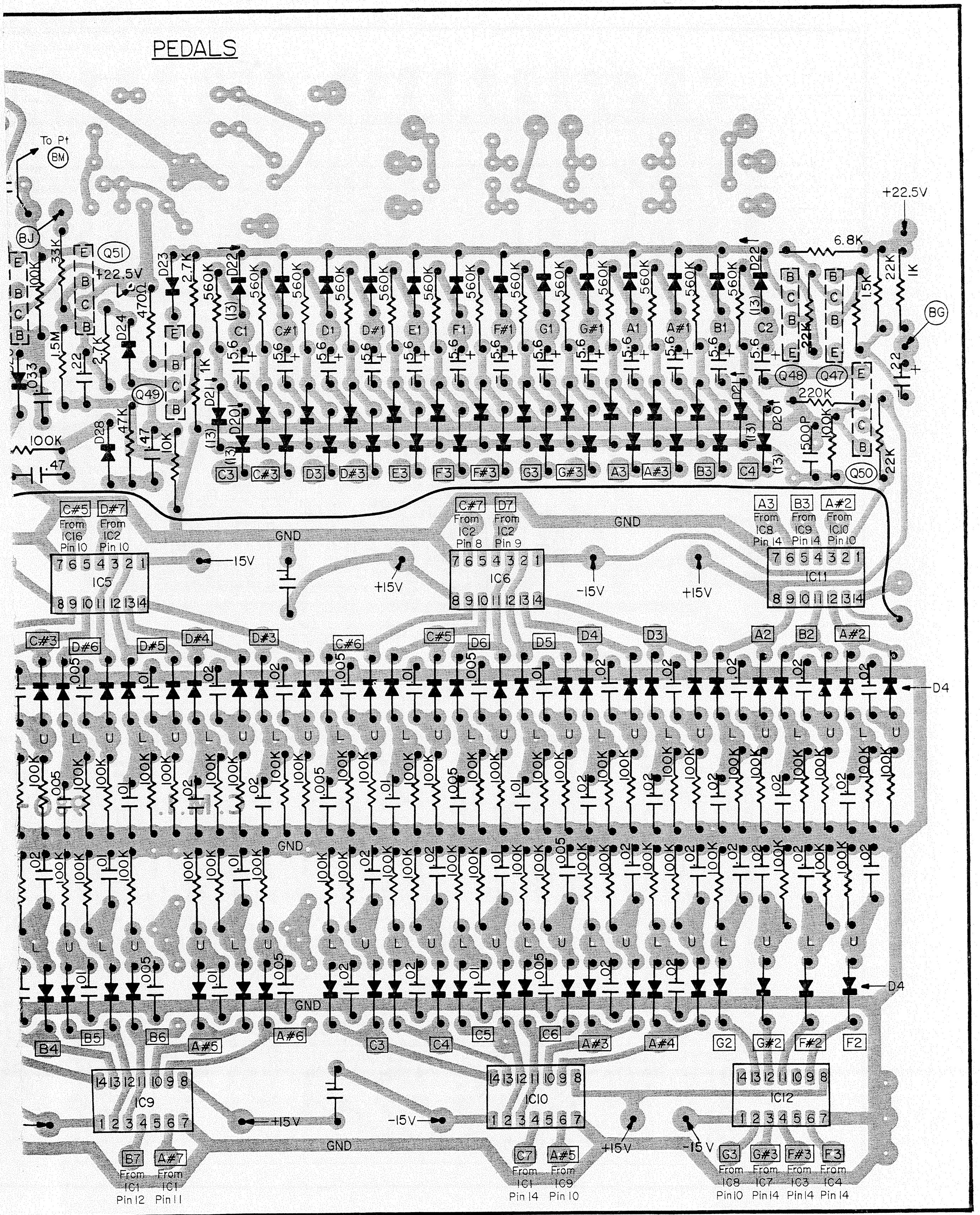
Amplifier Board 16

Amplifier/Power Supply/Expression Pedal (Top View) 17

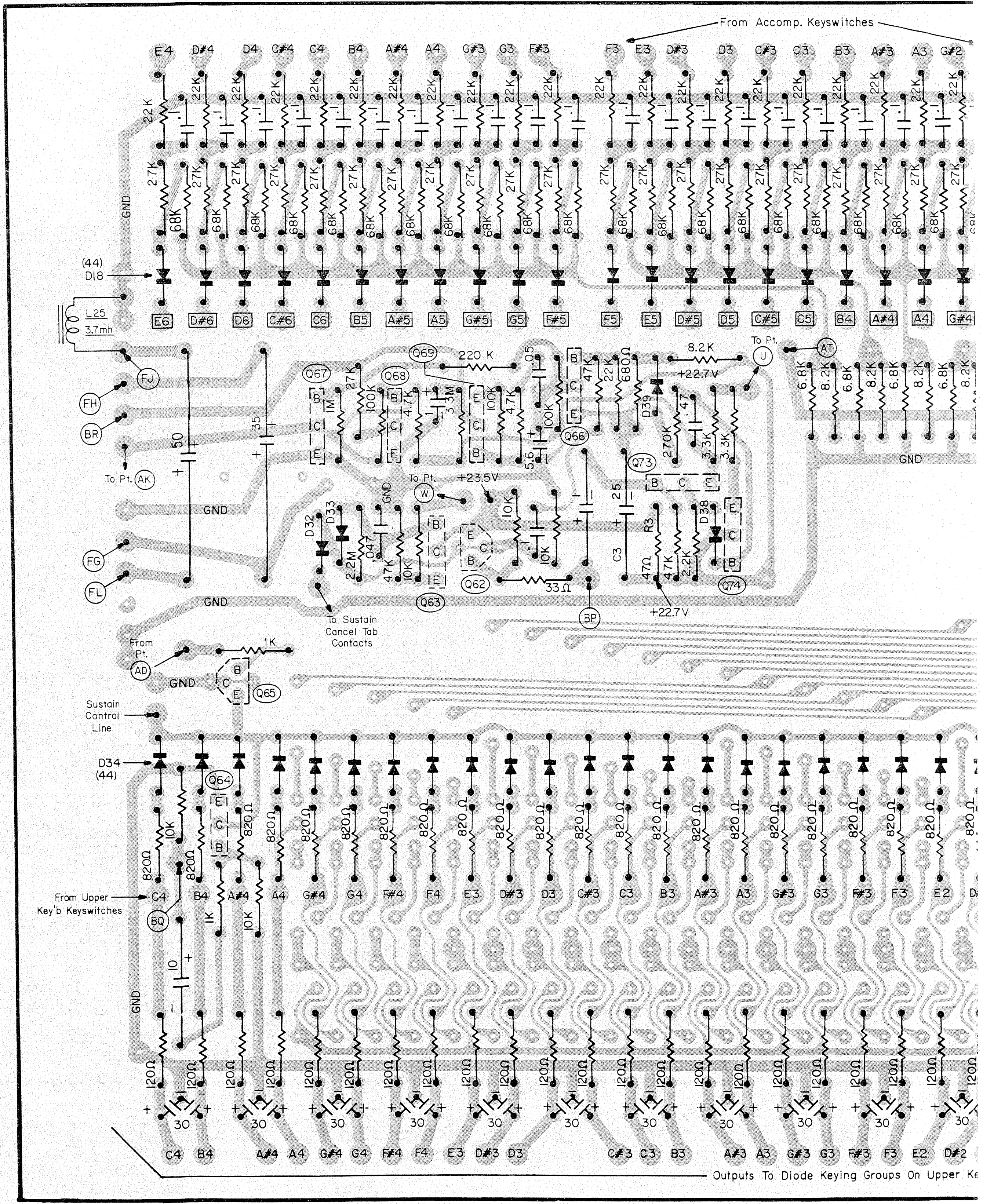
Amplifier/Power Supply/Expression Pedal (Bottom View) 18


MASTER OSC.
VIBRATO
DIVIDERS
To Upper Key'b Diode Keying
D3 (13)
Tuning Coil
L2 74 uh
L1 70uh
500P
6.8K
GND
220P
.001
68P
200P
4.7K
100K
470K
10K
D1
Q4
E B C B
D2
330 Ω
+14.2V
-14V
R16 180 Ω
R17 470 Ω
C12
C15
5.6
-3V
IC1
IC2
C7
C8
B7
A#7
A7
G#7
G7
F#7
F7
E7
D#7
D7
C#7
To Dividers
.002
100K
GND
C2
.25
Harmonica Adj.
250K
VR2
+23.5V
+22.5V
1.2M
47 Ω
R2
10K
To Vib. Switching Contacts
2.2K
15K
1.5K
150K
Q3
Q2
Q1
15 Ω
10M
.082
.068
120K
To Q16
47K
From Pt. AL
Vibrato Speed Adj. VR1
68K
33K
1.8K
BT
BK
BN
D29
D27
.033
A
B
C
E5 From IC4 Pin 10
F#7 From IC2 Pin 13
E7 From IC2 Pin 11
F7 From IC2 Pin 12
IC3
IC4
-15V
+15V
E4
E3
F#6
F#5
F#4
F#3
E6
E5
F6
F5
F4
F3
C#4
D4
To Upper & Lower Diode Keying Groups
U
L
.02
.01
.005
G#3
G#4
G#5
G#6
G5
G6
A3
A4
A5
A6
G3
G4
B3
IC7
IC8
G#7 From IC1 Pin 9
G7 From IC1 Pin 8
A7 From IC1 Pin 10
G5 From IC7 Pin 10

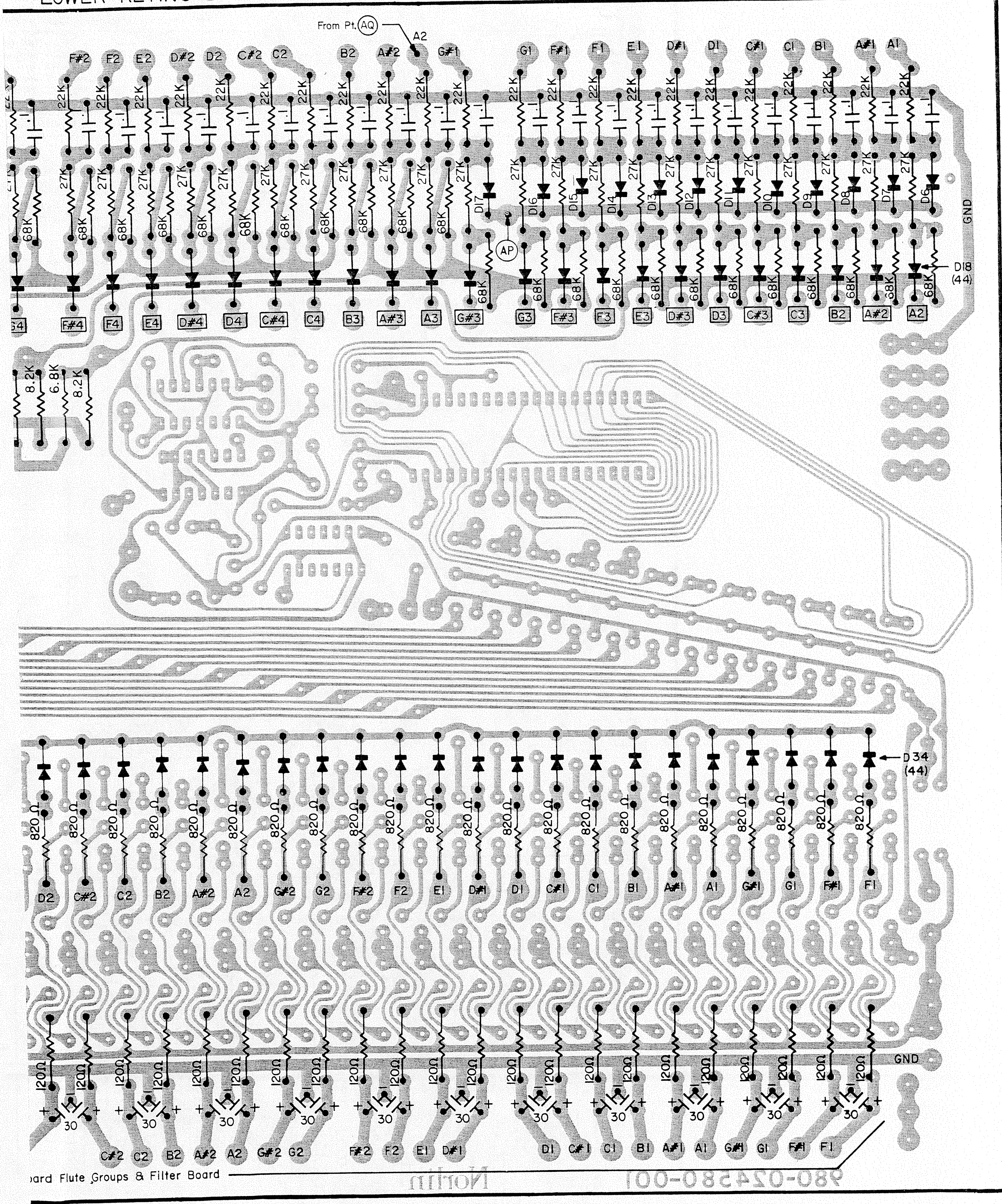
DIVIDERS & PEDAL BOARD

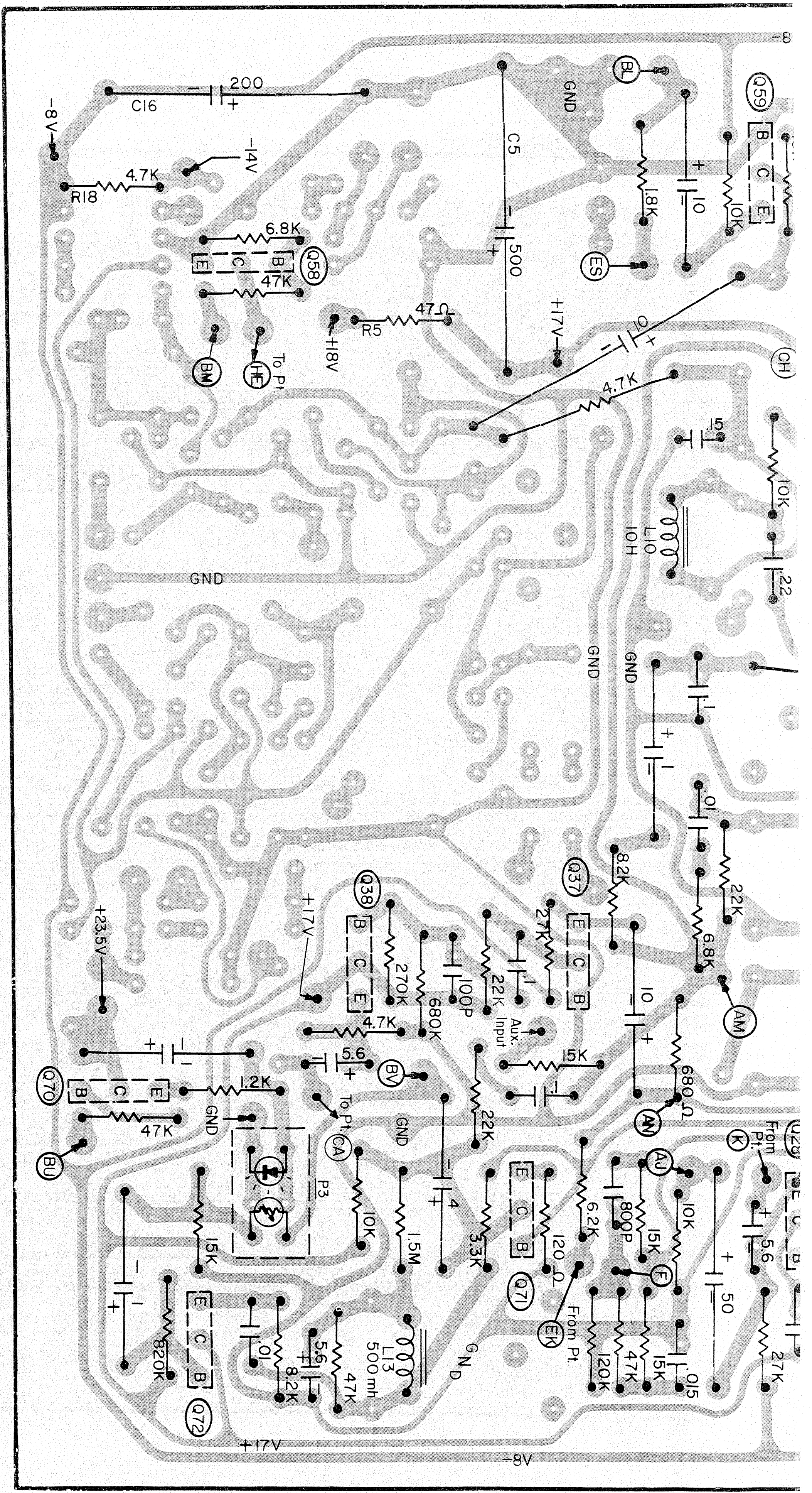

PEDALS
To Pt BM
BJ
Q51
+22.5V
E B C B
100K
33K
1.5M
.033
.22
2.7K
D23
D24
470Ω
2.7K
Q49
D28
47K
.47
10K
100K
.47
1K
D21
D20
(13)
560K
D22
C1 C#1 D1 D#1 E1 F1 F#1 G1 G#1 A1 A#1 B1 C2
5.6
C3 C#3 D3 D#3 E3 F3 F#3 G3 G#3 A3 A#3 B3 C4
6.8K
22K
1K
1.5K
BG
Q48
Q47
220K
500P
100K
22K
Q50
22
C#5 From IC16 Pin 10
D#7 From IC2 Pin 10
C#7 From IC2 Pin 8
D7 From IC2 Pin 9
A3 From IC8 Pin 14
B3 From IC9 Pin 14
A#2 From IC10 Pin 10
GND
-15V
+15V
IC5
IC6
IC11
7 6 5 4 3 2 1
8 9 10 11 12 13 14
C#3 D#6 D#5 D#4 D#3 G#6 C#5 D6 D5 D4 D3 A2 B2 A#2
D4
U L
100K
.005
.01
.02
B4 B5 B6 A#5 A#6 C3 C4 C5 C6 A#3 A#4 G2 G#2 F#2 F2
IC9
IC10
IC12
14 13 12 11 10 9 8
1 2 3 4 5 6 7
B7 From IC1 Pin 12
A#7 From IC1 Pin 11
C7 From IC1 Pin 14
A#5 From IC9 Pin 10
G3 From IC8 Pin 10
G#3 From IC7 Pin 14
F#3 From IC3 Pin 14
F3 From IC4 Pin 14

PERCUSSION & UPPER

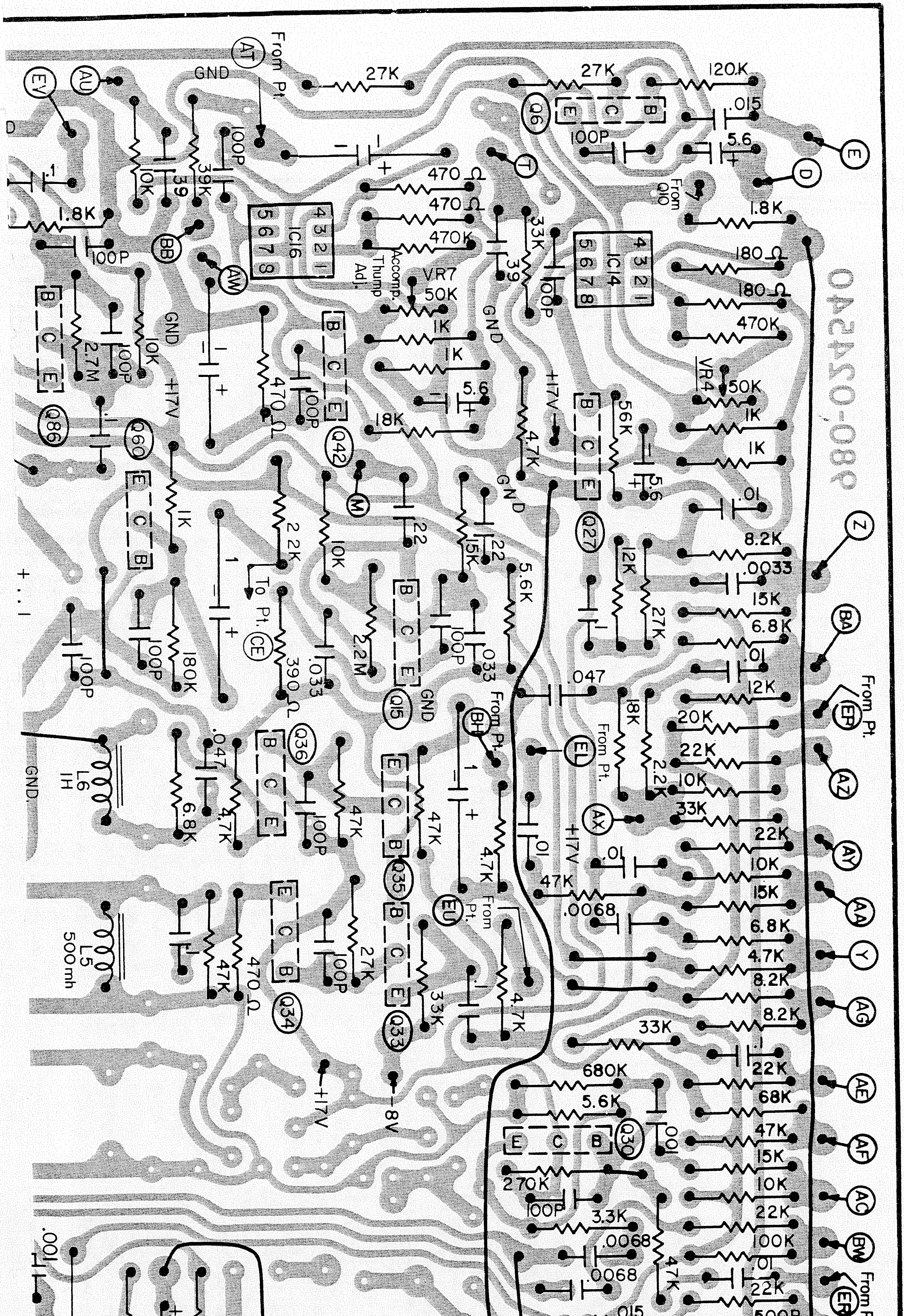

From Accomp. Keyswitches
E4 D#4 D4 C#4 C4 B4 A#4 A4 G#3 G3 F#3 F3 E3 D#3 D3 C#3 C3 B3 A#3 A3 G#2
22K
27K
68K
(44)
D18
GND
L25
3.7mh
E6 D#6 D6 C#6 C6 B5 A#5 A5 G#5 G5 F#5 F5 E5 D#5 D5 C#5 C5 B4 A#4 A4 G#4
FJ
FH
BR
To Pt. AK
50
35
FG
FL
GND
Q67
Q68
Q69
220 K
.05
27K
1M
100K
4.7K
3.3M
100K
4.7K
100K
5.6
47K
22K
680Ω
Q66
8.2K
To Pt. U
+22.7V
AT
D39
.47
270K
3.3K
3.3K
6.8K
8.2K
Q73
To Pt. W
+23.5V
25
R3
C3
D38
D32
D33
.047
2.2M
47K
10K
Q63
Q62
10K
33Ω
47Ω
47K
2.2K
Q74
BP
+22.7V
To Sustain Cancel Tab Contacts
From Pt. AD
1K
GND
Q65
B C E
Sustain Control Line
D34
(44)
Q64
10K
820Ω
From Upper Key'b Keyswitches
BQ
C4 B4 A#4 A4 G#4 G4 F#4 F4 E3 D#3 D3 C#3 C3 B3 A#3 A3 G#3 G3 F#3 F3 E2
1K
10K
10
GND
120Ω
30
C4 B4 A#4 A4 G#4 G4 F#4 F4 E3 D#3 D3 C#3 C3 B3 A#3 A3 G#3 G3 F#3 F3 E2 D#2
Outputs To Diode Keying Groups On Upper Ke

LOWER KEYING BOARD

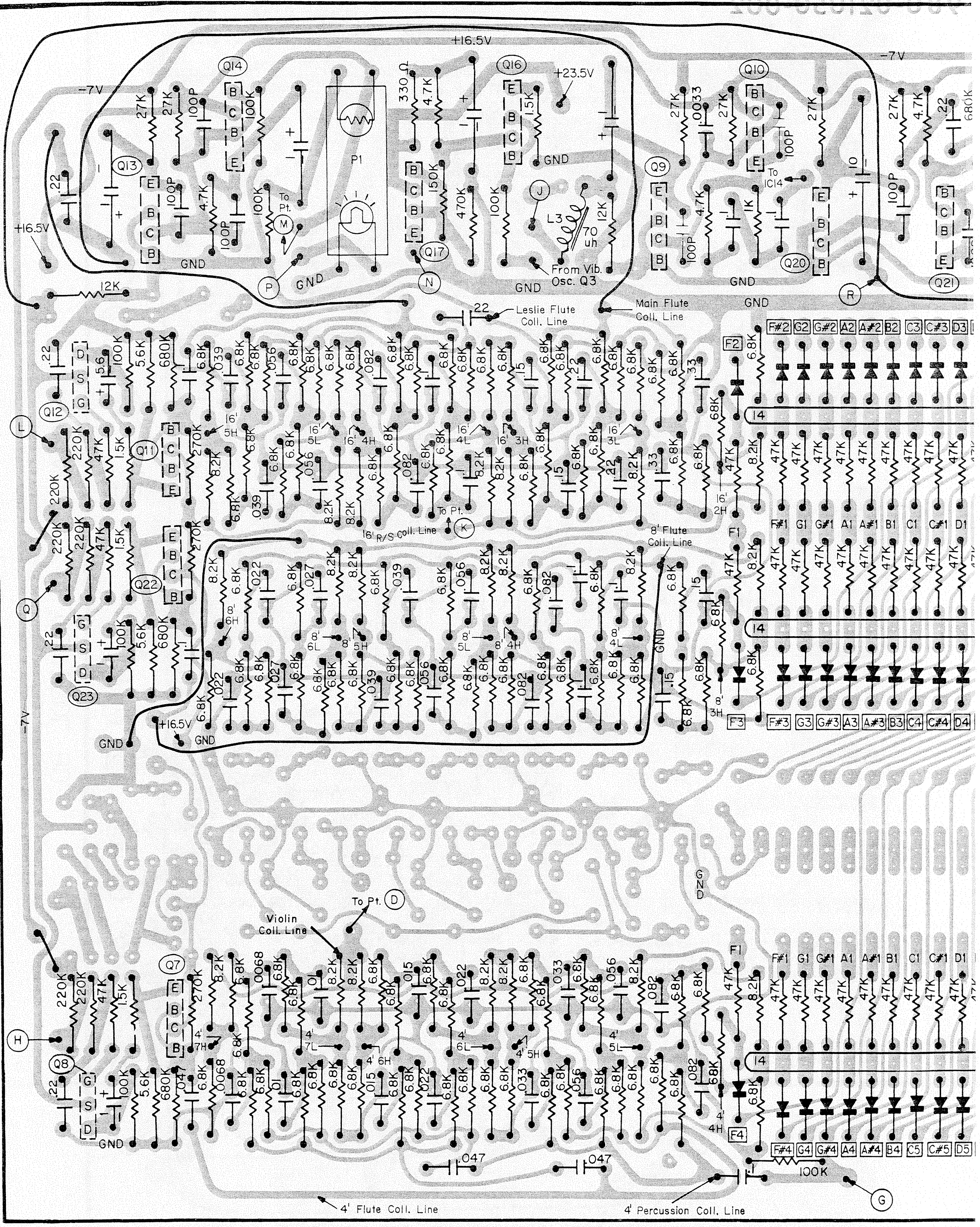

From Pt. AQ
A2
F#2 F2 E2 D#2 D2 C#2 C2 B2 A#2 G#1 G1 F#1 F1 E1 D#1 D1 C#1 C1 B1 A#1 A1
22K
.1
27K
68K
D17 D16 D15 D14 D13 D12 D11 D10 D9 D8 D7 D6
AP
GND
D18 (44)
F#4 F4 E4 D#4 D4 C#4 C4 B3 A#3 A3 G#3 G3 F#3 F3 E3 D#3 D3 C#3 C3 B2 A#2 A2
8.2K 6.8K 8.2K
D34 (44)
820Ω
D2 C#2 C2 B2 A#2 A2 G#2 G2 F#2 F2 E1 D#1 D1 C#1 C1 B1 A#1 A1 G#1 G1 F#1 F1
GND
120Ω
30
C#2 C2 B2 A#2 A2 G#2 G2 F#2 F2 E1 D#1 D1 C#1 C1 B1 A#1 A1 G#1 G1 F#1 F1
oard Flute Groups & Filter Board


-8V
C16
200
R18
4.7K
-14V
6.8K
47K
Q58
E C B
BM
To Pt. HE
+18V
R5
47Ω
C5
500
GND
BL
Q59
B C E
1.8K
10
10K
ES
+17V
CH
4.7K
.15
10K
L10
10H
.22
GND
GND
GND
.1
1
.01
8.2K
22K
6.8K
Q37
27K
E C B
.1
22K
Q38
B C E
270K
680K
100P
+17V
+23.5V
4.7K
Aux. Input
10
AM
15K
5.6
BV
Q70
B C E
1.2K
47K
GND
BU
To Pt. CA
GND
680Ω
AN
From Pt. K
Q28
P3
10K
1.5M
22K
4
3.3K
E C B
120Ω
6.2K
Q71
800P
AJ
15K
10K
F
5.6
50
E C B
15K
820K
E C B
Q72
.01
8.2K
5.6
47K
L13
500 mh
GND
From Pt. EK
120K
47K
15K
.015
27K
+17V
-8V

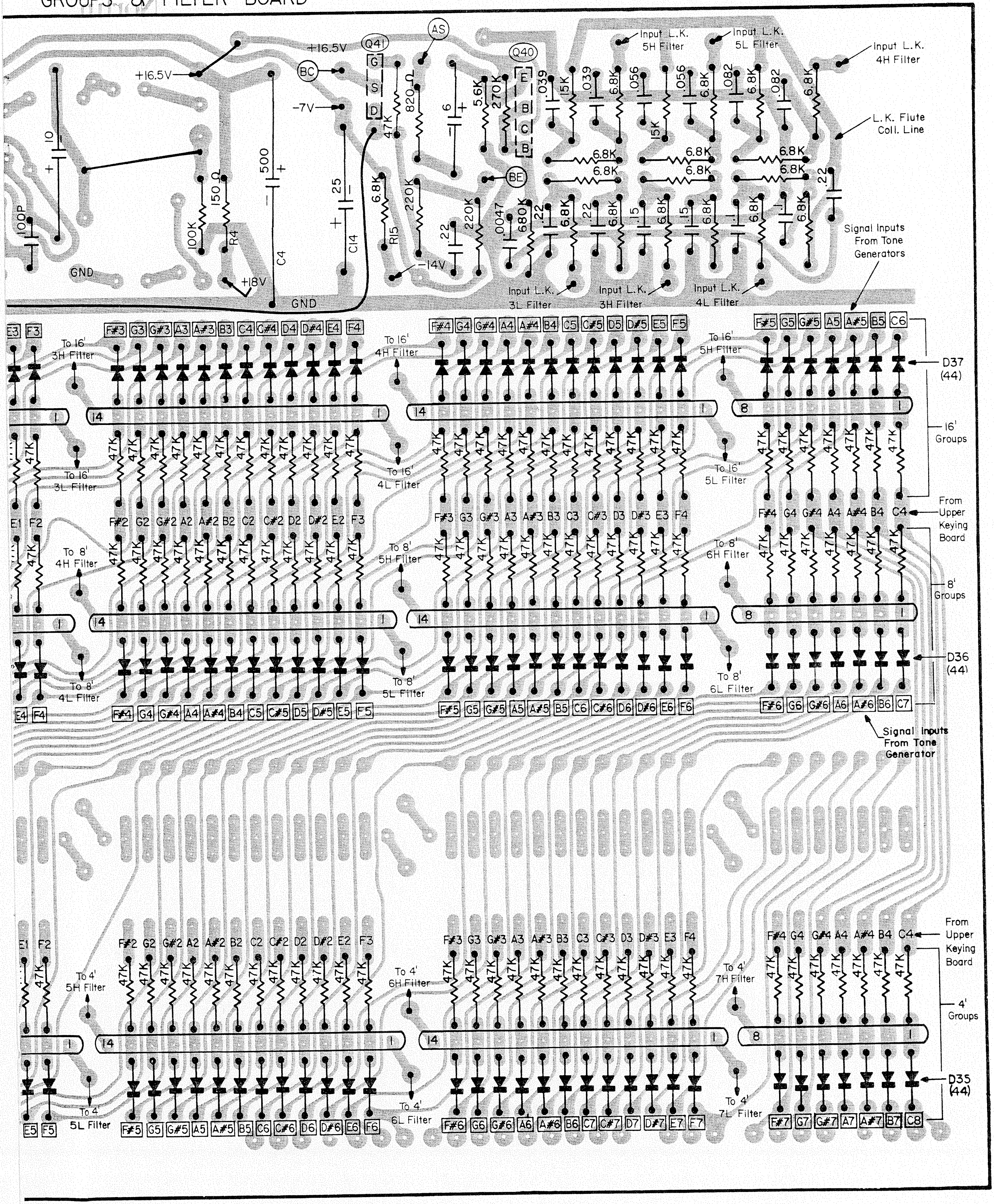
QUALITY CONTROL BD.


980-02540
IC14
IC16
Q6
Q15
Q27
Q29
Q30
Q33
Q34
Q35
Q36
Q42
Q60
Q86
VR4 50K
VR7 50K
Accomp. Thump Adj.
From Pt. AT
From Pt. EP
From Pt. ER
From Pt. BH
From Pt. EL
From Pt. EU
From Q10
To Pt. CE
L6 1H
L5 500mh
+17V
-8V
GND
E
D
Z
BA
AZ
AY
AA
Y
AG
AE
AF
AC
BW
AH
X
AU
EV
BB
AW
T
M
AX
AB
120K
27K
.015
5.6
100P
1.8K
180 Ω
470K
1K
.01
8.2K
.0033
15K
6.8K
12K
20K
22K
10K
33K
4.7K
680K
5.6K
270K
3.3K
.0068
47K
68K
100K
500P
470 Ω
39K
39
2.7M
2.2K
2.2M
390 Ω
.033
.047
18K
56K
180K
Morlin

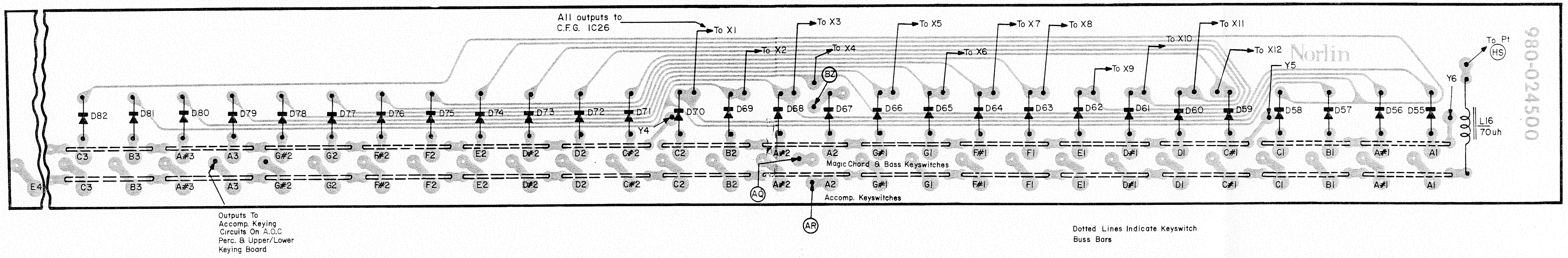
UPPER KEYBOARD FLUTE


+16.5V
-7V
+23.5V
Q14
Q16
Q10
Q13
Q9
Q17
Q20
Q21
Q12
Q11
Q22
Q23
Q7
Q8
P1
L3
70 uh
To Pt. M
P
N
J
R
L
Q
K
H
D
G
From Vib. Osc. Q3
To IC14
GND
12K
.22
Leslie Flute Coll. Line
Main Flute Coll. Line
16' R/S Coll. Line
To Pt. K
8' Flute Coll. Line
To Pt. D
Violin Coll. Line
4' Flute Coll. Line
4' Percussion Coll. Line
.047
100K
F1
F2
F3
F4
I4
F#2 G2 G#2 A2 A#2 B2 C3 C#3 D3
F#1 G1 G#1 A1 A#1 B1 C1 C#1 D1
F#3 G3 G#3 A3 A#3 B3 C4 C#4 D4
F#4 G4 G#4 A4 A#4 B4 C5 C#5 D5
16' 5H
16' 5L
16' 4H
16' 4L
16' 3H
16' 3L
16' 2H
8' 6H
8' 6L
8' 5H
8' 5L
8' 4H
8' 4L
8' 3H
4' 7H
4' 7L
4' 6H
4' 6L
4' 5H
4' 5L
4' 4H
6.8K
8.2K
47K
220K
270K
680K
5.6K
1.5K
4.7K
27K
100P
330 Ω
150K
470K
100K

GROUPS & FILTER BOARD

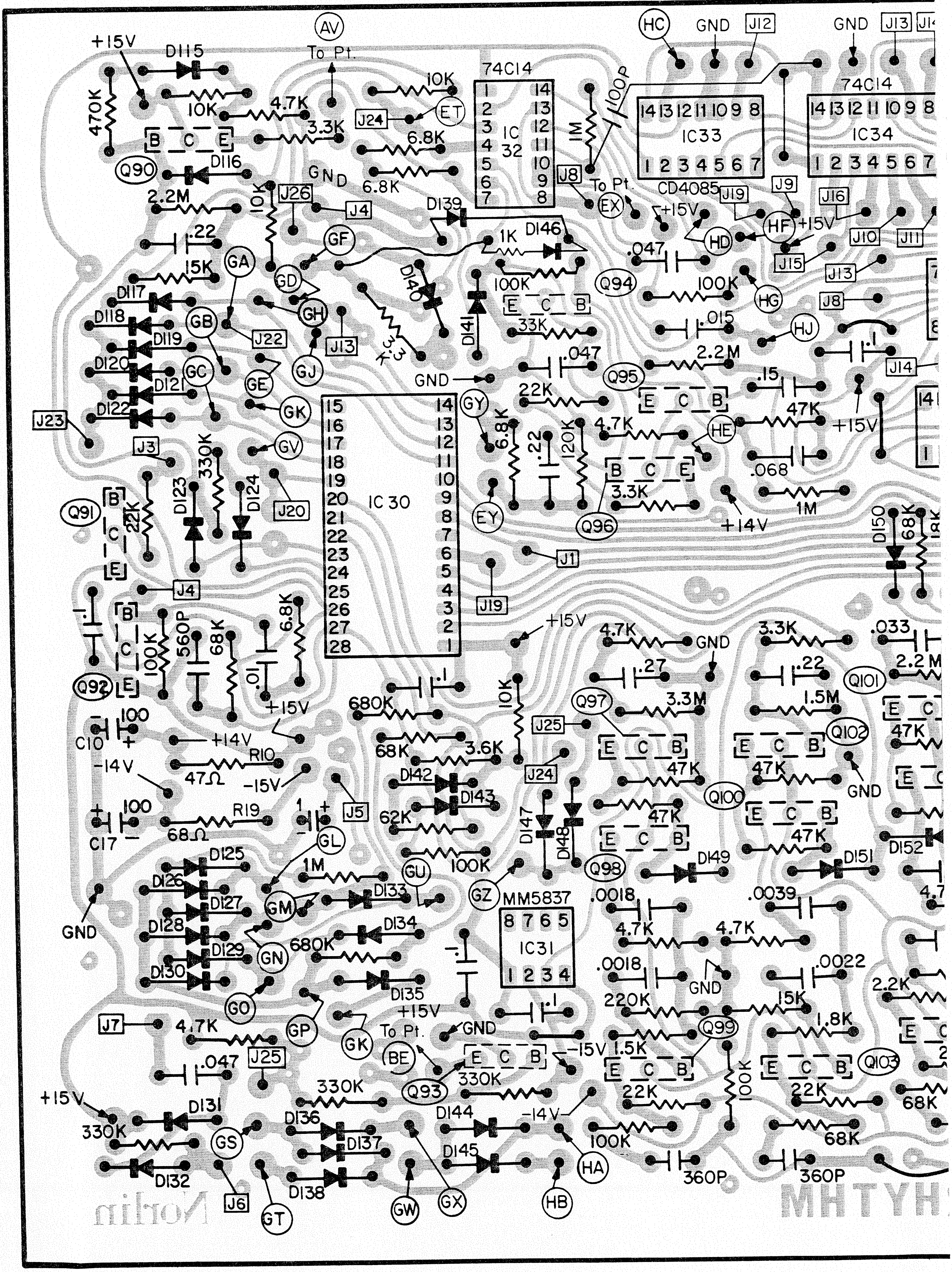

+16.5V
+16.5V
Q41
G
S
D
AS
BC
-7V
Q40
E
B
C
B
BE
Input L.K.
5H Filter
Input L.K.
5L Filter
Input L.K.
4H Filter
L.K. Flute
Coll. Line
10
100P
100K
150 Ω
R4
500
C4
25
C14
47K
820 Ω
6.8K
R15
220K
6
.22
220K
.0047
5.6K
270K
680K
.039
15K
.039
6.8K
.056
.056
15K
6.8K
.082
6.8K
.082
6.8K
6.8K
.22
.22
.15
.15
.1
.1
GND
+18V
-14V
GND
Input L.K.
3L Filter
Input L.K.
3H Filter
Input L.K.
4L Filter
Signal Inputs
From Tone
Generators
E3 F3
F#3 G3 G#3 A3 A#3 B3 C4 C#4 D4 D#4 E4 F4
F#4 G4 G#4 A4 A#4 B4 C5 C#5 D5 D#5 E5 F5
F#5 G5 G#5 A5 A#5 B5 C6
To 16'
3H Filter
To 16'
4H Filter
To 16'
5H Filter
D37
(44)
1
14
1
14
1
8
1
16'
Groups
To 16'
3L Filter
To 16'
4L Filter
To 16'
5L Filter
47K
E1 F2
F#2 G2 G#2 A2 A#2 B2 C2 C#2 D2 D#2 E2 F3
F#3 G3 G#3 A3 A#3 B3 C3 C#3 D3 D#3 E3 F4
F#4 G4 G#4 A4 A#4 B4 C4
From
Upper
Keying
Board
To 8'
4H Filter
To 8'
5H Filter
To 8'
6H Filter
8'
Groups
D36
(44)
To 8'
4L Filter
To 8'
5L Filter
To 8'
6L Filter
E4 F4
F#4 G4 G#4 A4 A#4 B4 C5 C#5 D5 D#5 E5 F5
F#5 G5 G#5 A5 A#5 B5 C6 C#6 D6 D#6 E6 F6
F#6 G6 G#6 A6 A#6 B6 C7
Signal Inputs
From Tone
Generator
E1 F2
F#2 G2 G#2 A2 A#2 B2 C2 C#2 D2 D#2 E2 F3
F#3 G3 G#3 A3 A#3 B3 C3 C#3 D3 D#3 E3 F4
F#4 G4 G#4 A4 A#4 B4 C4
From
Upper
Keying
Board
To 4'
5H Filter
To 4'
6H Filter
To 4'
7H Filter
4'
Groups
D35
(44)
To 4'
5L Filter
To 4'
6L Filter
To 4'
7L Filter
E5 F5
F#5 G5 G#5 A5 A#5 B5 C6 C#6 D6 D#6 E6 F6
F#6 G6 G#6 A6 A#6 B6 C7 C#7 D7 D#7 E7 F7
F#7 G7 G#7 A7 A#7 B7 C8

LOWER KEYSWITCH BOARD

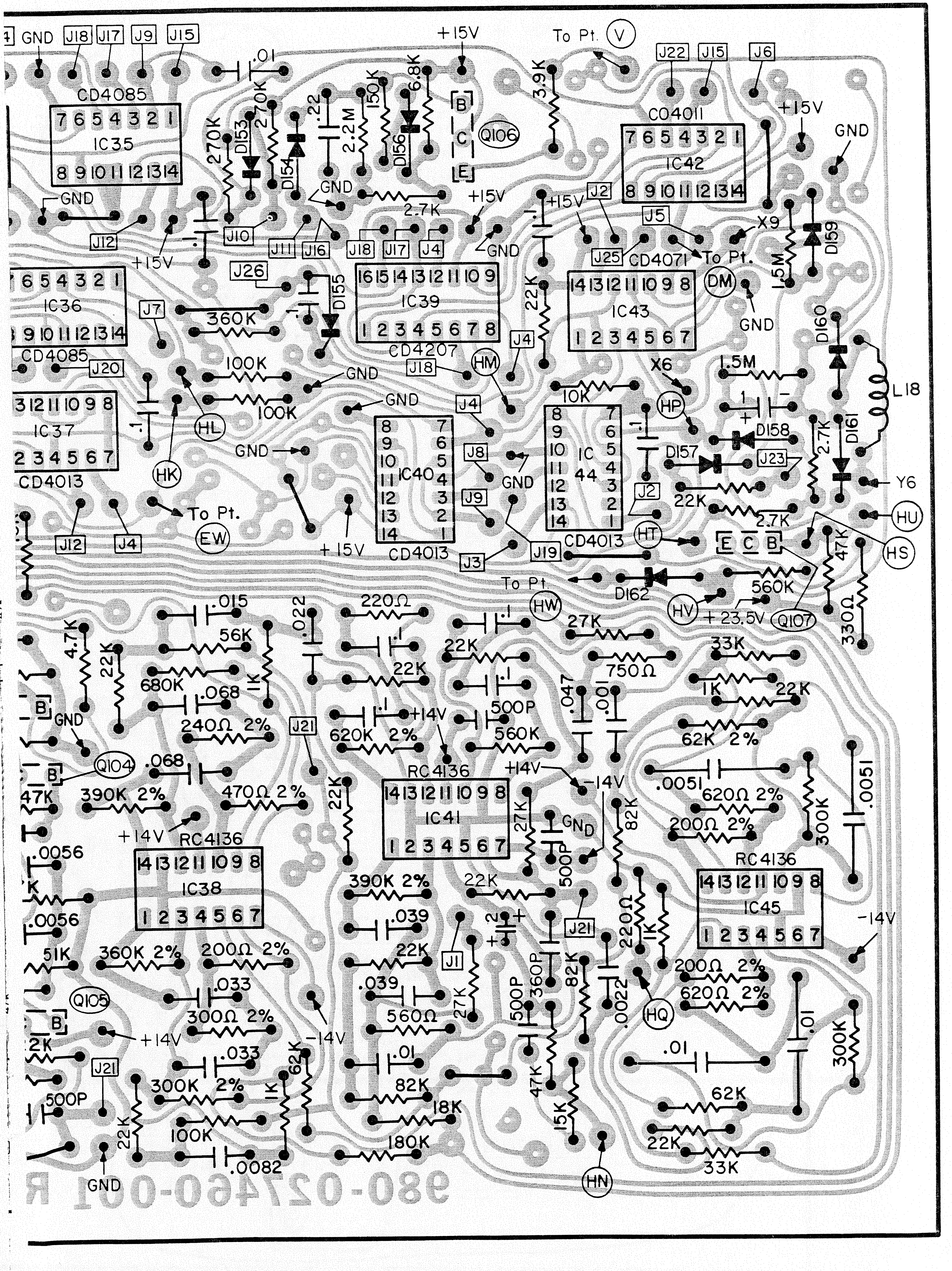

All outputs to C.F.G. IC26
To X1
To X2
To X3
To X4
To X5
To X6
To X7
To X8
To X9
To X10
To X11
To X12
To P1
HS
BZ
Y4
Y5
Y6
L16
70uh
Norlin
980-024500
D82
D81
D80
D79
D78
D77
D76
D75
D74
D73
D72
D71
D70
D69
D68
D67
D66
D65
D64
D63
D62
D61
D60
D59
D58
D57
D56
D55
E4
C3
B3
A#3
A3
G#2
G2
F#2
F2
E2
D#2
D2
C#2
C2
B2
A#2
A2
G#1
G1
F#1
F1
E1
D#1
D1
C#1
C1
B1
A#1
A1
Magic Chord & Bass Keyswitches
Accomp. Keyswitches
AQ
AR

Outputs To Accomp. Keying Circuits On A.O.C Perc. & Upper/Lower Keying Board

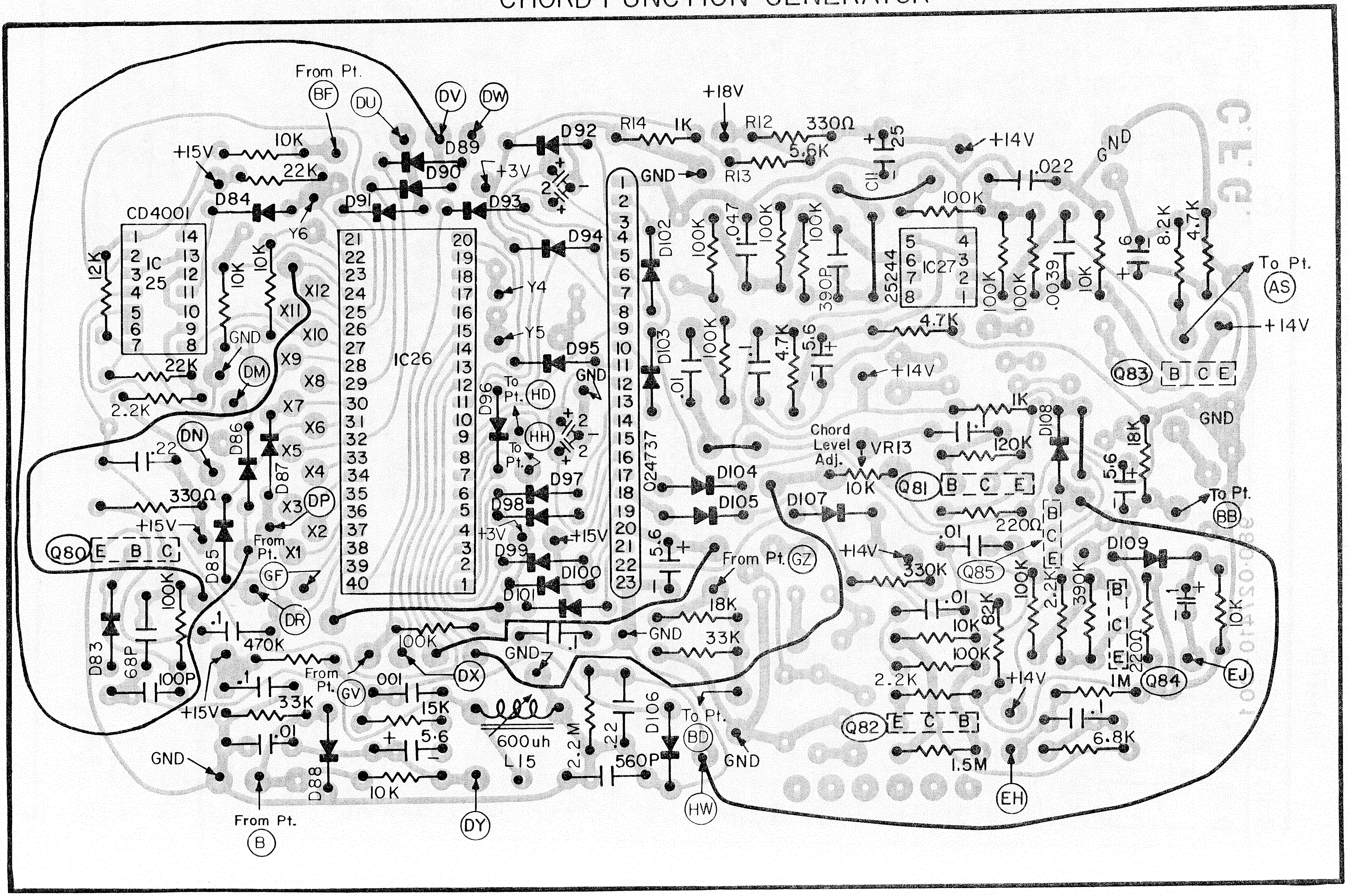
Dotted Lines Indicate Keyswitch Buss Bars


AV
To Pt.
+15V
D115
470K
10K
4.7K
3.3K
B C E
Q90
D116
2.2M
.22
15K
10K
6.8K
6.8K
GND
J24
ET
74C14
IC 32
1 2 3 4 5 6 7
14 13 12 11 10 9 8
J26
J4
D139
GF
GA
GD
GH
D117
D118
D119
D120
D121
D122
GB
GC
GE
GJ
J22
J13
D140
3.3K
D141
1K
D146
100K
E C B
33K
1M
100P
J8
To Pt.
EX
HC
GND
J12
GND
J13
74C14
IC33
IC34
CD4085
J19
J9
J16
+15V
HD
HF
+15V
J10
J11
.047
J15
Q94
100K
HG
J13
J8
.015
HJ
2.2M
.1
J14
.047
GND
Q95
22K
E C B
.15
47K
+15V
GK
GY
6.8K
.22
120K
4.7K
HE
J23
J3
GV
330K
IC 30
15 16 17 18 19 20 21 22 23 24 25 26 27 28
14 13 12 11 10 9 8 7 6 5 4 3 2 1
B C E
3.3K
Q96
.068
1M
+14V
J20
D123
D124
Q91
22K
EY
J1
D150
68K
J19
J4
560P
68K
100K
6.8K
.01
Q92
+15V
4.7K
GND
3.3K
.033
.27
.22
2.2M
Q101
680K
.1
10K
Q97
3.3M
1.5M
E C B
Q102
47K
100
C10
+14V
R10
-14V
47Ω
-15V
68K
3.6K
J25
J24
E C B
47K
E C B
47K
GND
D142
D143
Q100
100
C17
R19
68Ω
J5
62K
D147
D148
47K
E C B
47K
E C B
D152
GL
100K
Q98
D149
D151
D125
D126
D127
D128
D129
D130
GM
1M
D133
GU
GZ
MM5837
IC31
8 7 6 5
1 2 3 4
.0018
.0039
4.7
GND
D134
GN
680K
4.7K
4.7K
.0018
GND
.0022
2.2K
D135
GO
+15V
220K
15K
Q99
1.8K
J7
4.7K
GP
GK
To Pt.
GND
BE
E C B
-15V
1.5K
E C B
E C B
Q103
.047
J25
Q93
330K
22K
100K
22K
68K
330K
+15V
D131
D136
D137
D144
-14V
330K
GS
100K
68K
D132
J6
D138
GT
GW
GX
D145
HA
HB
360P
360P
Norlin
RHYTHM

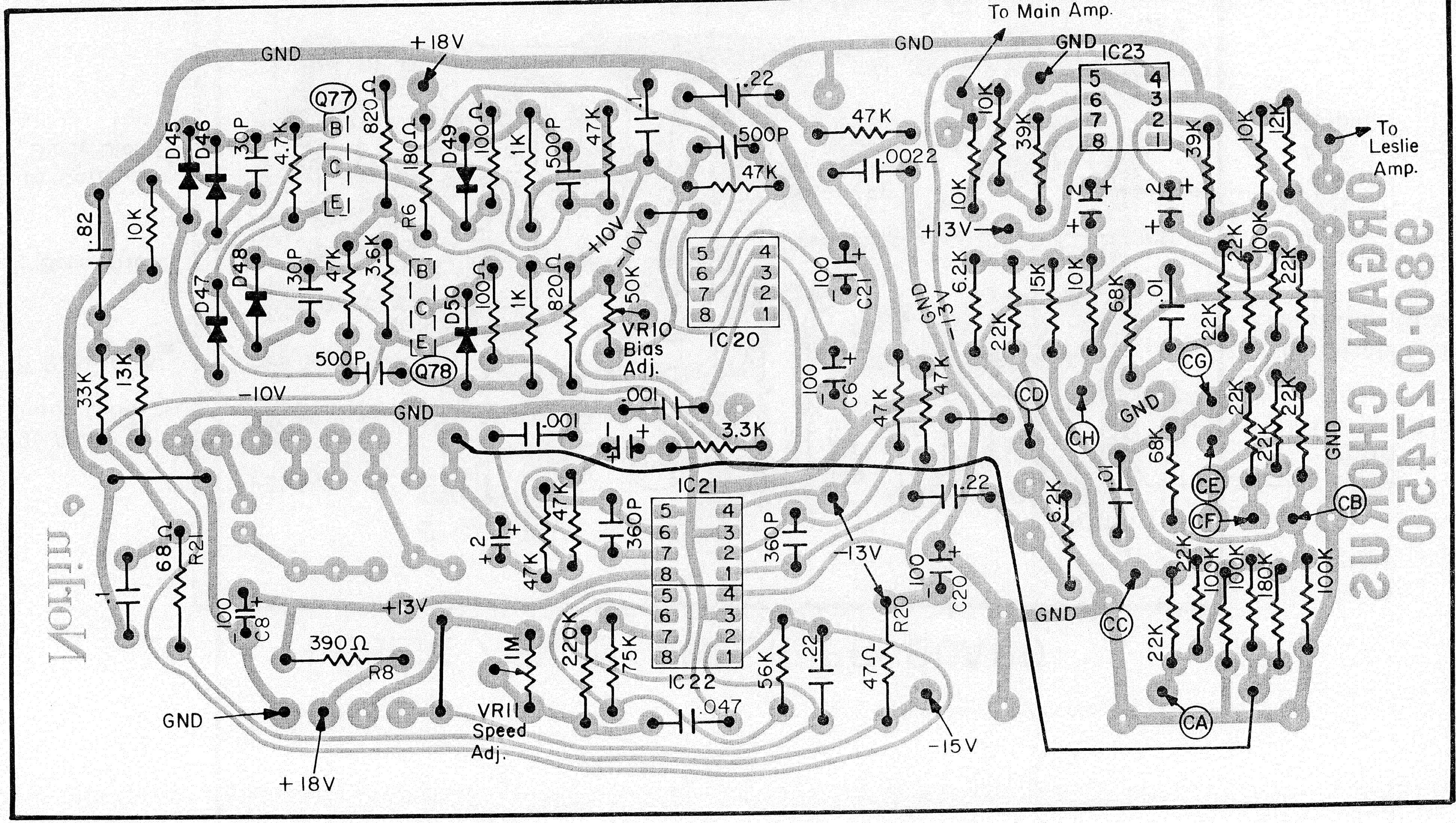
BOARD


GND
J18
J17
J9
J15
+15V
To Pt. V
J22
J15
J6
.01
CD4085
IC35
7 6 5 4 3 2 1
8 9 10 11 12 13 14
270K
D153
270K
D154
.22
2.2M
150K
D156
6.8K
B
C
E
Q106
3.9K
C04011
IC42
+15V
GND
GND
2.7K
+15V
J2
J5
X9
D159
J12
+15V
J10
J11
J16
J18
J17
J4
GND
J25
CD4071
To Pt. DM
1.5M
J26
D155
16 15 14 13 12 11 10 9
IC39
1 2 3 4 5 6 7 8
CD4207
22K
14 13 12 11 10 9 8
IC43
1 2 3 4 5 6 7
GND
IC36
J7
360K
CD4085
J20
100K
100K
GND
J18
HM
J4
X6
1.5M
D160
L18
IC37
CD4013
HL
HK
GND
IC40
J4
J8
GND
J9
10K
IC 44
HP
D158
D157
J23
2.7K
D161
Y6
J2
22K
2.7K
HU
To Pt. EW
J12
J4
+15V
CD4013
J3
J19
CD4013
HT
E C B
47K
HS
To Pt.
D162
560K
HW
HV
+23.5V
Q107
330Ω
4.7K
22K
.015
56K
680K
.068
1K
.022
220Ω
.1
22K
.1
27K
22K
750Ω
33K
1K
22K
B
GND
240Ω 2%
J21
.1
+14V
620K 2%
.1
500P
560K
.047
.001
62K 2%
Q104
B
.068
47K
390K 2%
470Ω 2%
22K
RC4136
14 13 12 11 10 9 8
IC41
1 2 3 4 5 6 7
+14V
-14V
.0051
620Ω 2%
200Ω 2%
300K
.0051
27K
GND
500P
82K
+14V
RC4136
IC38
.0056
.0056
390K 2%
22K
RC4136
IC45
-14V
.039
2
J21
220Ω
1K
51K
360K 2%
200Ω 2%
J1
22K
.033
.039
360P
82K
.0022
200Ω 2%
620Ω 2%
Q105
B
300Ω 2%
27K
500P
HQ
.01
300K
+14V
-14V
560Ω
.033
.01
.01
J21
300K 2%
62K
1K
82K
47K
62K
500P
22K
100K
18K
15K
22K
.0082
180K
33K
GND
HN
980-02460-001 R

CHORD FUNCTION GENERATOR

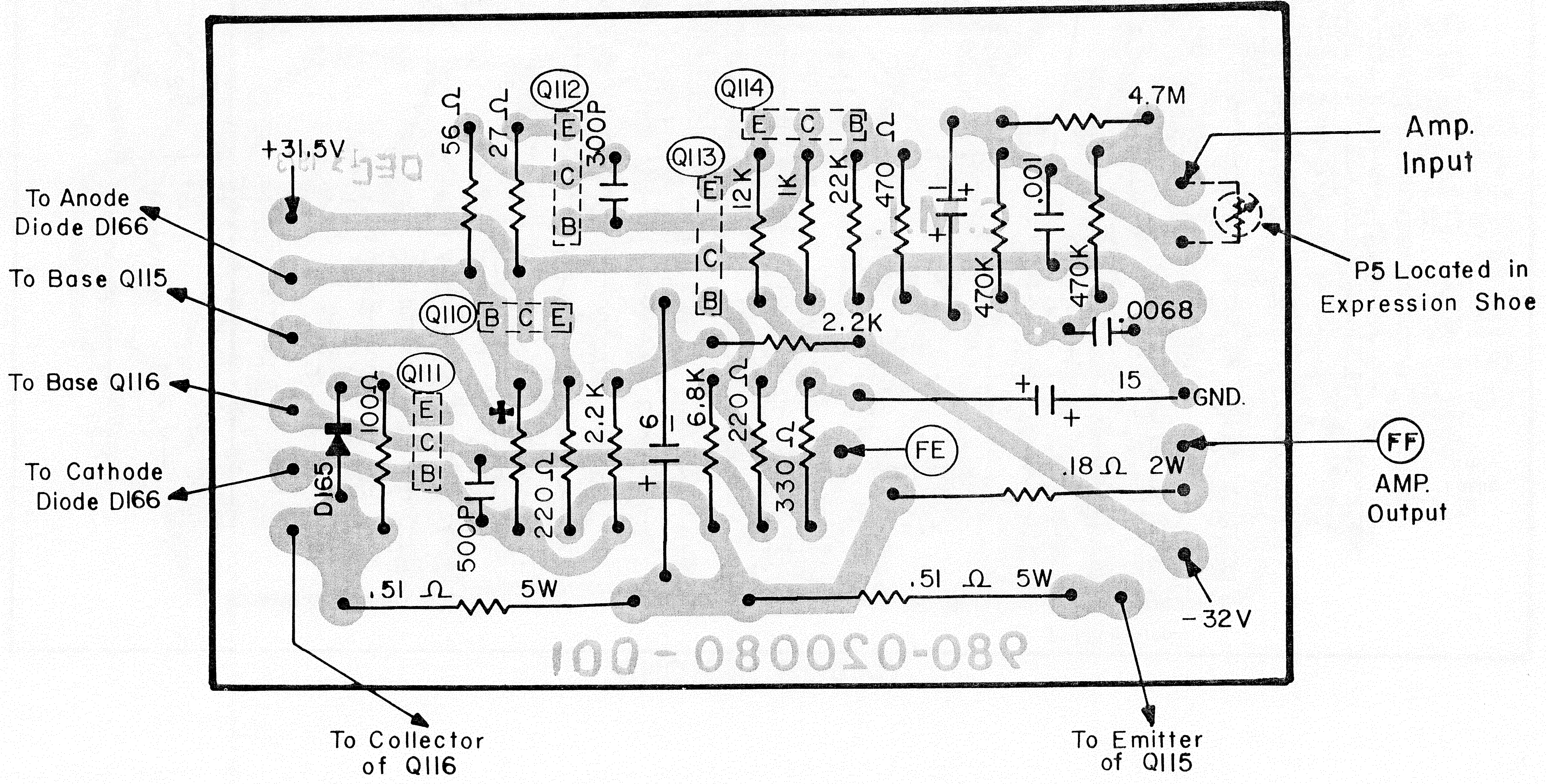

From Pt.
BF
DU
DV
DW
+15V
10K
22K
D89
D90
D84
Y6
D91
D92
D93
+3V
2
R14
1K
+18V
R12
330Ω
5.6K
R13
GND
+ 25
C11
+14V
.022
GND
CD4001
IC 25
1
2
3
4
5
6
7
14
13
12
11
10
9
8
12K
10K
10K
X12
X11
X10
X9
X8
X7
X6
X5
X4
X3
X2
X1
GND
DM
22K
2.2K
IC26
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
20
19
18
17
16
15
14
13
12
11
10
9
8
7
6
5
4
3
2
1
Y4
Y5
D94
D95
GND
To Pt.
HD
HH
D96
D97
D98
D99
D100
D101
+15V
024737
D102
D103
D104
D105
D106
D107
D108
D109
100K
.047
100K
100K
390P
25244
IC27
100K
100K
.0039
10K
6
8.2K
4.7K
To Pt.
AS
+14V
4.7K
.01
100K
4.7K
5.6
Q83
B C E
1K
Chord
Level
Adj.
VR13
10K
120K
18K
5.6
GND
Q81
B C E
To Pt.
BB
220Ω
.01
B
C
E
DN
.22
D86
D87
DP
330Ω
Q80
E B C
D85
From
Pt.
GF
DR
D83
68P
100K
100P
.1
470K
100K
GND
.1
From
Pt.
GV
001
DX
+15V
33K
.01
15K
5.6
600uh
L15
2.2M
.22
560P
10K
D88
GND
From Pt.
B
DY
From Pt.
GZ
18K
GND
33K
To Pt.
BD
HW
GND
+14V
330K
Q85
.01
10K
82K
100K
2.2K
100K
2.2K
390K
B
IC
E
220Ω
10K
+14V
1M
Q84
EJ
Q82
E C B
.1
6.8K
1.5M
EH
C.E.G.

CHORUS BOARD



To Main Amp.
GND
+18V
GND
IC23
5 6 7 8
4 3 2 1
To Leslie Amp.
Q77
B
C
E
820Ω
180Ω
R6
D49
100Ω
1K
500P
47K
.1
.22
500P
47K
.0022
47K
10K
39K
10K
39K
10K
12K
2
2
+13V
D45
D46
30P
4.7K
.82
10K
D47
D48
30P
47K
3.6K
B
C
E
D50
100Ω
1K
820Ω
+10V
-10V
50K
VR10 Bias Adj.
5 6 7 8
4 3 2 1
IC20
100
C21
GND
-13V
6.2K
22K
15K
10K
68K
.01
22K
100K
22K
22K
500P
Q78
33K
13K
-10V
GND
.001
.001
3.3K
100
C6
47K
47K
CD
CH
GND
CG
22K
22K
22K
GND
68K
.01
CE
CF
CB
6.2K
IC21
5 6 7 8
4 3 2 1
47K
47K
2
360P
360P
.22
-13V
100
C20
R20
68Ω
R21
.1
100
C8
+13V
390Ω
R8
1M
VR11 Speed Adj.
220K
75K
5 6 7 8
4 3 2 1
IC22
56K
.22
47Ω
.047
GND
GND
CC
22K
22K
100K
100K
180K
100K
CA
-15V
GND
+18V

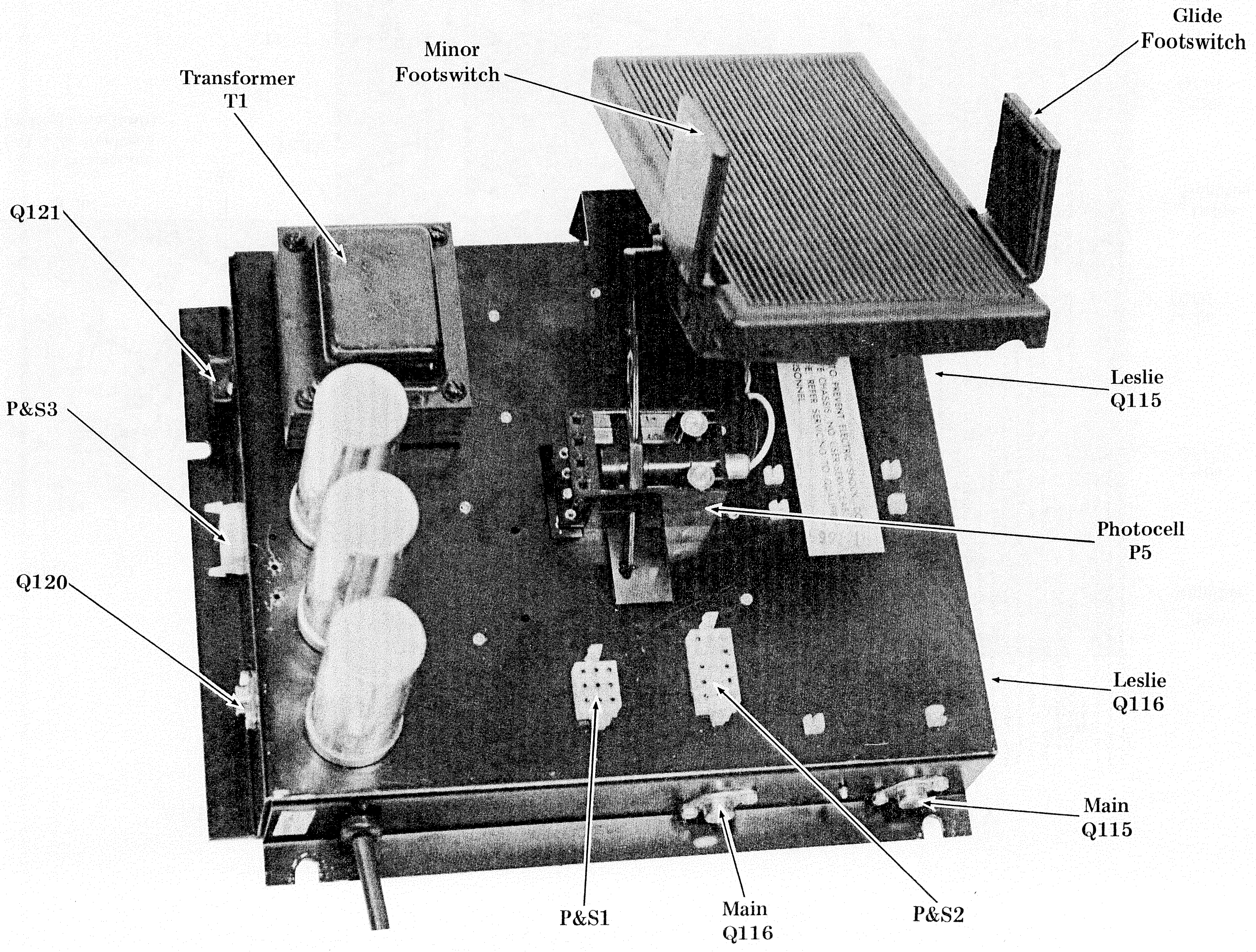
LESLIE / MAIN AMPLIFIER BOARD



+31.5V
56 Ω
27 Ω
Q112
E
C
B
300P
Q114
E C B
Ω
Q113
E
C
B
12K
1K
22K
470
4.7M
.001
470K
470K
.0068
2.2K
Q110
B C E
Q111
E
C
B
100Ω
D165
500P
220Ω
2.2K
6
6.8K
220 Ω
330 Ω
FE
15
GND.
.18 Ω 2W
.51 Ω 5W
.51 Ω 5W
−32V
To Anode Diode D166
To Base Q115
To Base Q116
To Cathode Diode D166
To Collector of Q116
To Emitter of Q115
Amp. Input
P5 Located in Expression Shoe
FF
AMP. Output

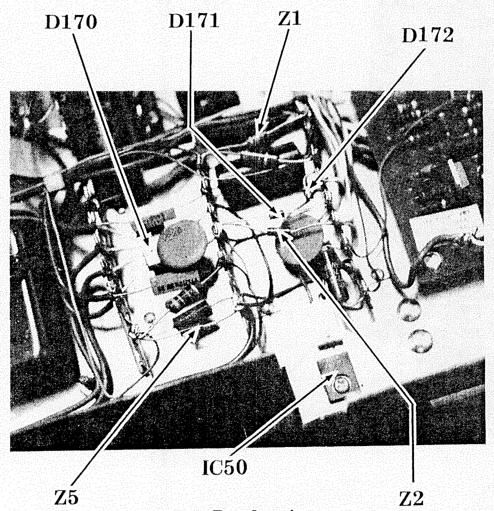
AMPLIFIER/POWER SUPPLY & EXPRESSION PEDAL ASSEMBLY

(Top View)

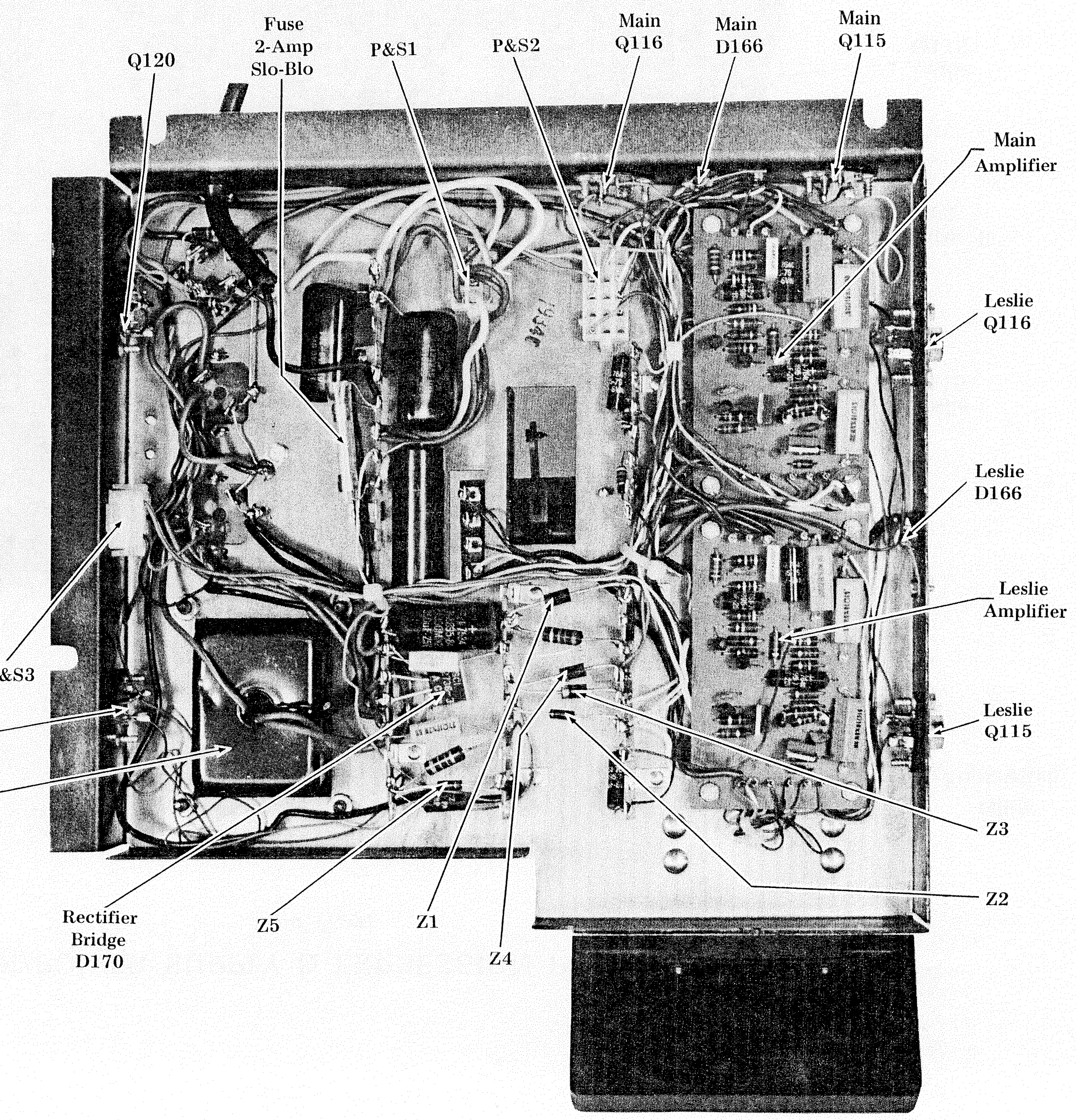

Glide Footswitch
Minor Footswitch
Transformer T1
Q121
Leslie Q115
P&S3
Photocell P5
Q120
Leslie Q116
Main Q115
P&S1
Main Q116
P&S2

AMPLIFIER/POWER SUPPLY & EXPRESSION PEDAL ASSEMBLY

(Bottom View)


D170
D171
Z1
D172
Z5
IC50
Z2

Later Production
(Z3 & Z4 Replaced
by Regulator IC50)


Q120
Fuse
2-Amp
Slo-Blo
P&S1
P&S2
Main
Q116
Main
D166
Main
Q115
Main
Amplifier
Leslie
Q116
Leslie
D166
Leslie
Amplifier
Leslie
Q115
Z3
Z2
P&S3
Q121
T1
Rectifier
Bridge
D170
Z5
Z1
Z4